Railroad Age Gazette

Including the Railroad Gazette and The Railway Age

PUBLISHED EVERY FRIDAY BY
THE RAILROAD GAZETTE (INC.), 83 FULTON STREET, NEW YORK.

CHICAGO: 160 Harrison St. PITTSBURGH: Farmers' Bank Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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The address of the company is the address of the officers.

Subscription, including regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free.

United States and Mexico.....$5.00 a year
Canada.....$6.00 a year
Foreign Edition, London.....£1 12*s* ($8.00) a year
Single Copies.....15 cents each

Entered at the Post Office at New York as mail matter of the second class.

VOL. XLV., No. 24. FRIDAY, NOVEMBER 13, 1908.

CONTENTS

EDITORIAL:
The Chinese Eastern Railroad.....1327
Average Freight Car Movement.....1327
State Grade Crossing Laws.....1327
Passenger Train Mileage and Passenger Revenues.....1328
A Campaign of Railroad Education.....1329
Chicago & North-Western.....1330
Chicago, Milwaukee & St. Paul.....1331
New Publications.....1332

ILLUSTRATED:
New Lackawanna Station at Scranton.....1335
Method of Reporting and Studying Rail Failures on the Harriman Lines.....1339
Young Rotary Valve and Gear for Locomotives.....1342
The Electrification of the St. Clair Tunnel.....1346
A New Underground Railroad Through Berlin.....1352
Electrification of Melbourne Suburban Lines.....1355

LETTERS TO THE EDITOR:
Private Car Lines.....1333
Car Wheel Stresses.....1334

MISCELLANEOUS:
Forest Fires.....1338
The Rail Mill of the Indiana Steel Mill at Gary.....1353
Foreign Railroad Notes.....1337, 1338, 1356

GENERAL NEWS SECTION:
General News.....1357
Traffic News.....1360
Equipment and Supplies.....1365
Railroad Officers.....1371
Railroad Construction.....1373
Railroad Financial News.....1376

China has a controversy with the Chinese Eastern Railroad Co., which is nominally an independent corporation, but substantially the agent of the Russian government. The original contract of the company with China provided that the company should exercise independent administrative authority on the property belonging to the railroad, and another clause authorized the company to buy land adjacent to the railroad. Under this authority the company acquired large amounts of land not required for railroad purposes, especially at stations, much of which it has sold again to people who have built upon or otherwise improved it, claiming to reserve rights of administration over it, which it has latterly given a wide interpretation to, substantially establishing a municipal government dependent upon the company and entirely independent of the government of China; as if an American company owning a railroad in Mexico should set up municipal governments at its chief stations. The chief of these is Harbin, where the Chinese Eastern crosses the navigable Sungari river and the South Manchurian Railroad to Port Arthur branches off. Naturally this is an important place, in a fertile country, with the chief shops of the railroad. Here the company bought a large amount of land at some distance from the old town and laid out a town-site. It sold lots largely to men who came there to go into business—to Germans, English, Americans and Japanese, more than to Russians, who have not been very enterprising in Manchurian trade. The town has already something like 50,000 inhabitants and is growing fast. For this town (the new one) the railroad company has provided a city government, consisting of what we may call a Mayor and a Board of Aldermen, to which offices men of all nationalities are eligible. Pretty nearly all its actions, however, require the approval of the railroad administration, which names directly several members of the Board. In the first government chosen there is one German, while all the rest are Russians. The Chinese authorities forbid their subjects to take any part in the election. They claim that the administrative rights granted to the company extend only to the management and protection of its own property.

In his articles on "The Theory of Railroad Rates" Professor Ripley referred (*Railroad Age Gazette*, Sept. 18, p. 953) to the small average daily mileage of freight cars in 1906—about 30 miles—as "extraordinarily low." Perhaps no figure is oftener cited by shippers and writers on railroad economics to illustrate what is looked upon as poor railroad management. As long as this figure is thus cited it will be necessary to keep on pointing out that it does not mean what it seems to. It includes the *non-movement* of all cars that are in the shops or are idle. Equipment becomes idle through failure of shippers to furnish plenty of traffic for it the year around; and it is good, not bad, management to send it to the shops as often and as soon as it needs repairs. Equipment does not become idle merely in hard times. Live stock cars can be kept busy only at certain seasons. The same is true of coal cars. The movement of foreign cars is a better index of the efficiency of railroad management than that of home cars, because cars usually leave the roads to which they belong under load, and are promptly moved on by the receiving line after being unloaded. On one of the large trunk lines on which the mileage of foreign cars is kept separately from that of home cars, the average daily movement of foreign cars is over 40 miles, and is often 50 miles per day, whereas the movement of home cars averages about 20 miles and is rarely over 25. The general average movement for both kinds of cars on this line is between 25 and 30 miles per day. The laws of various states, and the rules of the car service associations allow shippers minima of 48 hours to load and 48 hours to unload, the time being figured from 7 o'clock a.m. after the car is placed; and still larger allowances of free time are made in numerous cases. If the average journey of a car under load were 150 miles—it is believed to be about 185 miles—its average mileage per day, assuming it to be kept the full 48 hours time allowed for loading and unloading, would be only 30 miles, although it made the entire journey in a single day. Taking into consideration all the facts, it is plain that the small daily mileage of cars is much more due to their non-movement than to their slow movement. The problem of car efficiency is more a problem of getting shippers to let go of cars than of getting railroads to pull them rapidly.

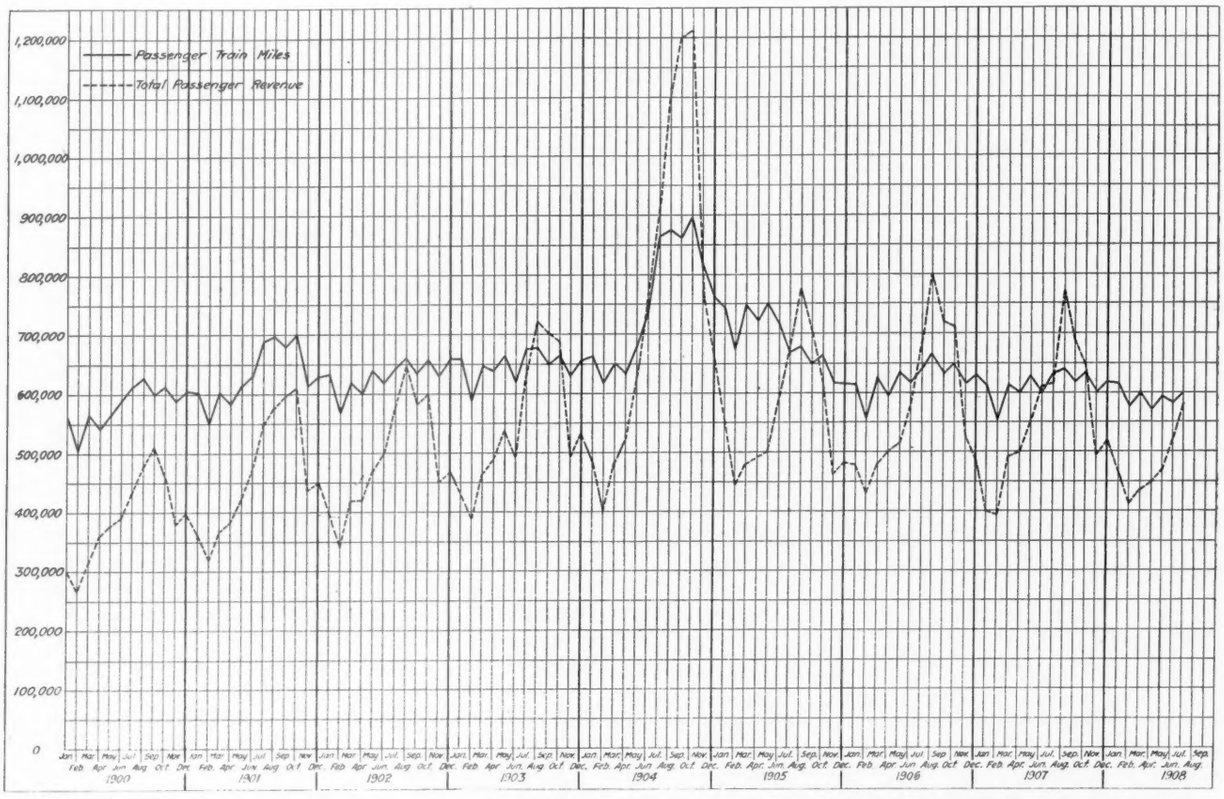
The American Railway Engineering and Maintenance of Way Association has made a compilation of state laws bearing on the matter of separation of grades at crossings of railroads and public roads. About one-half of the states have no laws whatever on this matter; and while the majority of these are western states, four are in the extreme east, namely, Maine, New Hampshire, Delaware and South Carolina. In most of the states having laws, the entire burden of the expense is placed on the railroad companies. In only three states is the cost equitably divided, that is, shared equally by the railroad and the community. These are Connecticut, New York and Ohio. Two states—Massachusetts and Vermont—distribute it 65 per cent. to the railroad, 25

per cent. to the state and 10 per cent. to the municipality, while in New Jersey, Pennsylvania and Rhode Island the division is a matter of agreement. At the conference of the railroad commissioners of Illinois, Indiana, Ohio, Michigan and Wisconsin held in Chicago in June (*Railroad Age Gazette*, June 19, p. 199) this subject of separation of grades was discussed, the opinion being expressed that there should be legislation in all states to require the elimination of grades, and that the expense should be divided equally between the railroads and the community. While the fairness of this last proposition is unquestionable, the fact that only three of the states having laws on the matter make such a division suggests the advisability of the railroads giving special attention to securing this provision in legislation which may be adopted by states not now having it. The movement in the five states mentioned, which resulted in the formation of a permanent organization, undoubtedly will bear fruit which may be expected to influence other states to act. A first move of this organization will be to ascertain how many unprotected grade crossings there are in the states represented and what can be done to eliminate them. Indiana alone was said to have 10,000. When the vast number which the country as a whole contains is considered there is little wonder that 934 persons were killed and 1,817 injured at these crossings in the year ended June 30, 1907 (Interstate Commerce Commission report). The strong sentiment at this conference that no new construction in the states represented should be allowed to have grade crossings either with highways or other railroads, merits the support of existing roads. Not only should no further increase in conditions so inimical to safe transportation be allowed in communities having the population and traffic density of these, but there should be systematic reduction of the unprotected crossings already in existence. Connecticut is the only state making specific provision for this in its statute. It requires the removal of at least one grade crossing a year for every 60 miles of road operated within the state.

PASSENGER TRAIN MILEAGE AND PASSENGER REVENUES.

The accompanying drawing shows the relation between passenger-train miles and passenger earnings, exclusive of mail and express business, on a large trunk line for a period of almost eight years. While the figures are for only one road, they may be taken to illustrate principles that are applicable to the passenger business of most American railroads.

The figures on the left-hand margin refer both to passenger earnings and train-miles, the same unit being used for both dollars and miles. When the two lines coincide earnings were $1 per train-mile. When the revenue line is above the train-mile line earnings were more than $1 per train-mile; when it is below they were less. The cost of handling passenger business on this road—common, or indirect, expenses being apportioned on the train-mileage basis—averaged 85 cents per train-mile. Therefore, earnings of $1 per train-mile were considered tolerably remunerative, and earnings less than this were regarded as unremunerative. When earnings were less than 85 cents per mile it was considered that passenger business was handled at a positive loss.



Number of Passenger Train Miles and Total Passenger Revenue by Months, 1900-1908.

Upon these bases it appears that the passenger business of this road was unprofitable continuously from January, 1900, to July, 1903, when for the first time average earnings became as much as $1 per train-mile.

One of the most interesting points illustrated by the drawing is the way that earnings rose throughout the spring and summer of each year, usually reaching their maximum in August, and fell throughout the fall and winter of each year, except during the holidays, usually reaching their minimum in February. There were corresponding, but far from proportional, variations in train mileage.

The period covered by the drawing may for convenience be divided into two periods, one 1900-1904, inclusive, the other 1905-1908, inclusive. During the latter period there was more conservatism than in the former in increasing passenger mileage in proportion to business in summer and less conserva-

tism in curtailing it in winter. The results are shown by the chart. The differences between them can perhaps be best illustrated by the figures for the month in each year when business was lightest and the month when it was heaviest. The following table gives the results in these extreme months during the first period, the cost of handling the business being figured on the basis of 85 cents per train-mile:

Date.	Train mileage.	Cost of handling the business.	Earnings.	Loss.	Net earnings
January, 1900	550,000	$467,500	$300,000	$167,500	.....
September, 1900	600,000	510,000	510,000	.....	.....
February, 1901	550,000	467,500	310,000	157,000	.....
September, 1901	675,000	573,750	600,000	.....	$26,250
February, 1902	560,000	476,000	325,000	151,000	.....
August, 1902	660,000	561,000	650,000	.....	89,000
February, 1903	590,000	501,500	390,000	188,500	.....
August, 1903	675,000	573,750	730,000	.....	156,250
February, 1904	615,000	522,750	400,000	122,750	.....
October, 1904	890,000	756,500	1,210,000	.....	453,500

In no case was the loss in the poorest month of any year less than $100,000. In no case were the net earnings from passenger traffic in the best month of any year more than $160,000 except in October, 1904. The high peak for that month on the drawing, when earnings reached the large sum of $1,210,000 and net earnings were $453,500, was caused by the heavy travel to the Louisiana Purchase Exposition at St. Louis, and it is not of much value in its bearing on the general subject.

The following table gives the same data for the best and worst months of each year during the second period:

Date.	Train mileage.	Cost of handling the business.	Earnings.	Loss.	Net earnings
February, 1905	560,000	$476,000	$440,000	$36,000	.....
August, 1905	670,000	569,500	770,000	.....	$200,500
February, 1906	550,000	467,500	440,000	27,500	.....
August, 1906	660,000	561,000	800,000	.....	239,000
February, 1907	550,000	467,000	400,000	67,500	.....
August, 1907	635,000	539,750	765,000	.....	225,250
February, 1908	570,000	595,000	410,000	74,500	.....
July, 1908	600,000	510,000	570,000	.....	60,000

In no case was the loss in the worst month in any year $75,000, and in no case were the net earnings in the best month less than $200,000. The net earnings in July, 1908, were less than this amount, but later statistics will doubtless show that net earnings in both August and September were larger than in July.

The better results secured during the second period are plainly due to the greater conservatism in the matter of train service. Compare, for example, the months of February, 1904, and February, 1908. In the former month passenger earnings were $400,000, and in the latter $410,000; but the loss in the former month was $48,250 greater than in the latter because the number of passenger-train miles in the former was 615,000, while in the latter it was but 595,000. Compare, likewise, August, 1902, with August, 1906. Earnings in the former were $650,000 and in the latter $800,000. Passenger train mileage in each of the two months, however, was 650,000 miles; the larger business was handled at the same cost as the smaller. Consequently, while in August, 1902, net earnings from passenger business were $89,000 in August, 1906, they were $239,000.

The following figures give the results of the passenger business for the last three months of 1907, when the 3-cent fare was in effect, and for the same months in 1908, when the 2-cent fare had been in effect almost a year:

Date.	Train mileage.	Cost of handling the business.	Earnings.	Loss.	Net earnings
April, 1907	600,000	$510,000	$500,000	$10,000	.....
April, 1908	525,000	446,250	450,000	.....	$3,750
May, 1907	625,000	531,250	500,000	31,250	.....
May, 1908	590,000	501,500	460,000	41,500	.....
June, 1907	600,000	510,000	610,000	.....	100,000
June, 1908	590,000	510,500	510,000	500	.....

The foregoing data, taken as a whole, shows how true it is that the question of what is a reasonable passenger fare for any railroad to charge is a question of service as well as of earnings. If the roads could agree to give only such service as the business available requires, and legislatures, commissions and public sentiment would let them carry out their agreement, they could, by reducing their passenger train mileage, make a 2-cent rate, or perhaps even a lower rate, profitable in many parts of the country. Suppose, for example, that they agreed, and were allowed to cut down their train service in cold weather in proportion to the heavy annual declines in travel. In this way the chronic deficits piled up in winter by such roads as the one figures for whose business have been given would be avoided and the profits of summer travel would not be constantly neutralized. Formerly much heavier reductions were made in passenger train mileage in winter than competition and public authorities more recently have allowed. Probably the road whose passenger business has been reviewed has gone as far in recent years in reducing or keeping down train mileage as any road would dare to go without agreements with its competitors and the approval of public authorities; but it has not gone far enough to make a 2-cent fare profitable. The figures seem to show that to make the passenger business as profitable proportionately as freight business it will have to be managed more like freight business. A chart for freight business on any road would show large fluctuations in freight train miles, but the lines for freight train miles and freight earnings would run approximately parallel to each other, instead of crossing and recrossing as do those in the accompanying illustration.

A CAMPAIGN OF RAILROAD EDUCATION.

The state of Connecticut has just passed through the most exciting and virulent political campaign in its history. In that campaign railroad questions, if not at the very front, formed a very large element in the issues at stake. Those issues, the activities of the canvass itself and the possible results hereafter, contain some valuable lessons and warnings in these days when politics everywhere have so pressed upon and invaded railroad interests.

The Connecticut trouble, in a railroad sense, goes back sixteen years when the frenzy for building street railways overcharged with water began. The new craze found a state railroad commission in office with abundant power to check overcapitalization, but a commission inert, untrained and in the nature of what has been justly called a "political" commission—the sort of commission only too familiar and in too many states. Trolley "enterprise" then found at first the New Haven Railroad Company almost as lethargic as the railroad commission. The corporation woke up a year or two later, when it discovered that the parallel trolleys were cutting badly its local traffic.

But it adopted short-sighted and, as the outcome proved, only temporary resistants. It fought the advancing trolleys in the legislature and the courts. But it made no efforts to keep down capitalization and make trolley building honest. It did nothing to brace up the state commission to compel honest returns; and not until later, after a losing battle, did it adopt the expedient of buying up the Connecticut trolleys, water and all, at a high price. In the outcome the Connecticut trolleys have been overcapitalized some $38,000,000 in stock and bonds, if judged by the Massachusetts standard of replacement value. But the stock water was already there. Connecticut legislatures, careless and fooled by "sneak" clauses in charter amendments, had authorized it, and a feeble state railroad commission had condoned it. The steam corporation had to take the trolleys or risk long-distance electric parallels.

Meanwhile the state railroad commission had gone from bad to worse. The dominant political party had become so strong and so fearless of defeat that it made the commission of three entirely partisan. Flaccid and non-partisan before it became flaccid and partisan since. Then, unfortunately, the head of the dominant party—the "boss" so-called—with

another member, active in politics, entered the commission, making two of its three members politicians in an acute sense. They were both influential in the naming, two years in advance, of the candidate for governor, recently successful, and against whom there was a stalwart "anti-machine" bolt which would have been successful in anything but a presidential campaign. Against him ran a director of the New Haven railroad company. As a result of all these elements combined the canvass, in its closing days, took on an anti-corporation and pro-corporation spirit. It was outwardly a case of the railroad in politics and politics in the railroad in the most superlative meanings. And, in the aftermath, there is projected to the fore of coming legislation in the state the agitating question of a public utility commission on a bill for which a special legislative commission has been at work for many months.

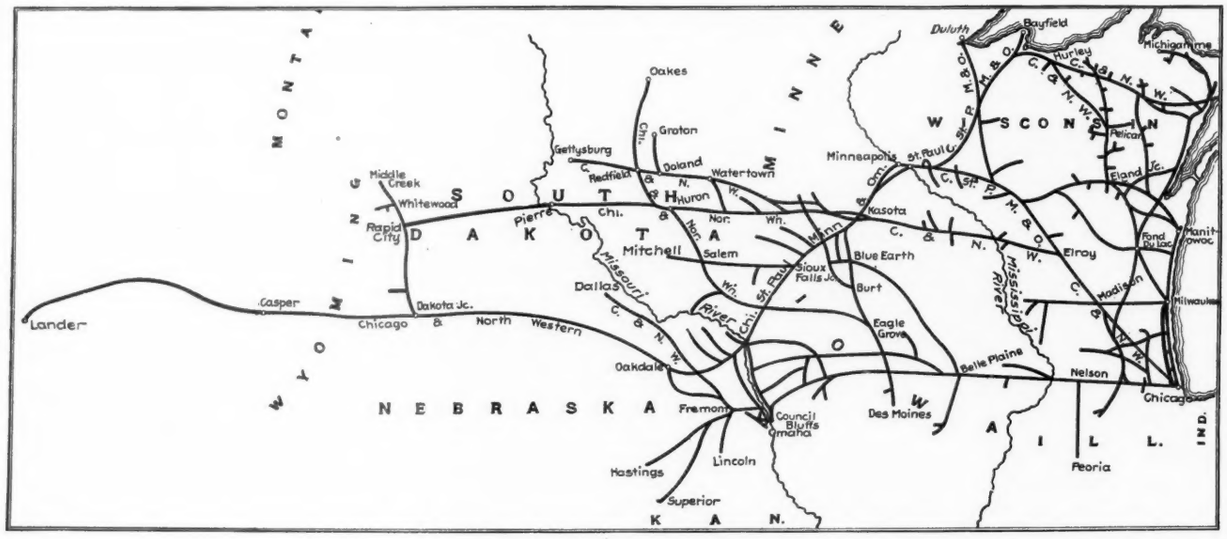
The next session of the state legislature will thus have before it railroad questions without number and sharp contests, with incidental harvests for the lobby, seem imminent.

Such a condensed record of railroad history leading up to a bitter campaign, in which one candidate has been taunted as a railroad officer and the other as the creature of a "political" railroad commission has had, after all, its educative side. It has turned the limelight upon actual facts of stock-watering. It has shown up the evils of making railroad commissions asylums for the party spoilsman; and it illustrates how any powerful railroad corporation which takes the long look ahead and adopts that policy which is most consonant with public honesty comes out best in the end. Using the conditional "if" and applying it to the Connecticut example, one sees a series of benign possibilities unfulfilled. If the New Haven company a dozen years or more ago had thrown its compelling forces against trolley hydraulics it would not now be shouldering overcapitalized street railway properties, nor the public called upon to earn lease money on the excess. If the Connecticut legislature had been more vigilant there would not have been the subtle lines in charter amendments that evaded the general law. If the state had not had a railroad commission invertebrated by politics, it would not now be wrestling with uncertain reform through a public utility commission plan, but it would be proud of the commission it already has. There would have been railroad questions necessary in the polity of the state. But they would have been economic questions rather than political ones and subjects for the committee room rather than for the noisy stump. And it is not to Connecticut alone that the hypotheses apply.

CHICAGO & NORTH-WESTERN.

Unlike the Chicago, Milwaukee & St. Paul, its near neighbor, competitor, and, in many respects, its prototype, the Chicago & North-Western has no extensive plan for becoming a through route between the Great Lakes and the Pacific coast. These roads, although having many points of similarity, are in a few respects quite different. The North-Western is a road made up largely of branches, drawing traffic from the prairie land west and southwest of Chicago and delivering it at Chicago, and distributing merchandise from Chicago. The St. Paul, on the other hand, even before the Pacific coast extension was undertaken, was composed largely of main line and therefore more logically had ambitions to become a trans-continental road. It is true that the North-Western has an authorized capital stock of $200,000,000, and but $122,007,459 outstanding in the hands of the public. The amount authorized, but not issued, is comparable to the $75,000,000 that the St. Paul has counted on to spend in building its pacific coast extension.

The new Chicago passenger terminal is the most important and most expensive project that the North-Western tells anything of in its annual report. Up to June 30, 1907, $4,909,422



Chicago & North-Western.

had been spent on this account, and the sum spent during the last year brought the total up to $9,777,038. This gives the North-Western nearly all the land needed for its new station, and work is now under way removing the old buildings and preparing a site for new construction. Another development of importance during the year was the opening of the Pierre, Rapid City & Northwestern and the Pierre & Ft. Pierre Bridge Railway, which together extend from Pierre on the Chicago & North-Western to Rapid City, S. Dak., 167 miles, and give the North-Western traffic originating in the Black Hills; the two roads being controlled by the C. & N.-W.

For the second year in its history the company made no charges from income for additions and betterments. There was spent for construction and equipment $7,988,185 last year and charged to capital account. This compares with $10,111,907 spent for equipment and construction and charged to capital account in 1907. These expenditures do not include the sums paid for the buildings and lands acquired in Chicago for the new passenger terminal.

The gross earnings of the company were hard hit by the generally unprosperous year, and revenue from freight especially decreased. The total operating revenues for the year ended June 30, 1908, were $63,219,344, a decrease of $5,140,021. Of the total revenues, $41,949,630 came from freight, being a decrease of $4,846,315, or 10 per cent. This corresponds almost exactly to a 10 per cent. decrease in tons of freight carried one

mile, and a decrease of 10 per cent. in mileage of revenue freight and mixed trains. We should therefore expect corresponding decreases in operating expenses; but the number of passengers carried one mile was 869,455,637, an increase of 8 per cent. against a decrease of nearly 2 per cent. in passenger revenue, which amounted to $15,734,607 last year; the average rate paid per passenger per mile decreasing 9 per cent. Expenses were $41,641,314 last year, a decrease of $2,520,781, or 6 per cent. Maintenance of way and structures cost $8,056,546 last year, a decrease of $1,030,795, and is an expenditure per mile of road operated of $1,056, as compared with $1,203 in the previous year.

The unit costs of maintenance of equipment for 1908 and 1907 compare as follows: Per locomotive $2,017 and $1,763, per passenger train car $513 and $514, per freight and work train car $47, as against $78. The company has beside its maintenance account an account for renewal and replacement of equipment. At the close of the 1907 fiscal year there was a credit balance of $1,175,287, and during the last year there was credited to this account from salvage and sale of equipment, and on account of charges to operating expenses, $1,620,878. The costs of new equipment were as follows:

40 freight locomotives	$668,626.01
1,002 box freight cars	801,865.75
50 stock cars	37,553.51
500 ore cars	409,091.43
Other items	19,527.05
Total	$1,936,663.75

A comparison between transportation expenses, traffic expenses and general expenses in the two years is impossible because no figures are given in the annual report; but since the expenditures for maintenance of way amounted to but 19.35 per cent. of operating expenses as compared with 20.58 per cent. in the previous year, and maintenance of equipment expenditures amounted to 16.27 per cent. as against 18.63 per cent. of total operating expenses in the previous year, we may safely assume that the unproductive expenses of conducting transportation and general expenses were as high or higher than in the previous year.

The balance sheet shows $5,034,000 general mortgage bonds due from the trustee in exchange for underlying bonds retired. This possibly explains in part a decrease in cash on hand from $27,320,938, as shown on June 30, 1907, to $11,506,243 on the same date this year. Current liabilities have also decreased from $11,512,075 to $9,806,874. The fact that the company prefers to pay out cash on hand to retire maturing underlying bonds than to issue its general mortgage bonds, is evidence that it can afford to wait for improvement in the securities market before selling either stock or bonds.

As in the case of the St. Paul, maintenance expenses are extremely low on the Chicago & North-Western, but so is capitalization. The St. Paul is an example of a road built largely from the proceeds of the sale of stock, and with a funded debt of but $17,213 per mile. The North-Western, on the other hand, has $19,318 funded debt per mile, but has only $16,489 capital stock issued and outstanding in the hands of the public per mile, as against $18,264 for the St. Paul. It is a line not only through the prairie, as is the St. Paul, but, as we have previously mentioned, largely made up of branches; so that its construction was comparatively inexpensive and its maintenance is even more noticeably inexpensive.

Since the Interstate Commerce Commission has prescribed that outside operations, including the operation of dining cars, be shown separately on the income account, it is interesting to note what return this gives the North-Western. It is one of the roads having its own dining car service, and it has the reputation of giving excellent service. This may explain the loss of $38,999 last year on its outside operation.

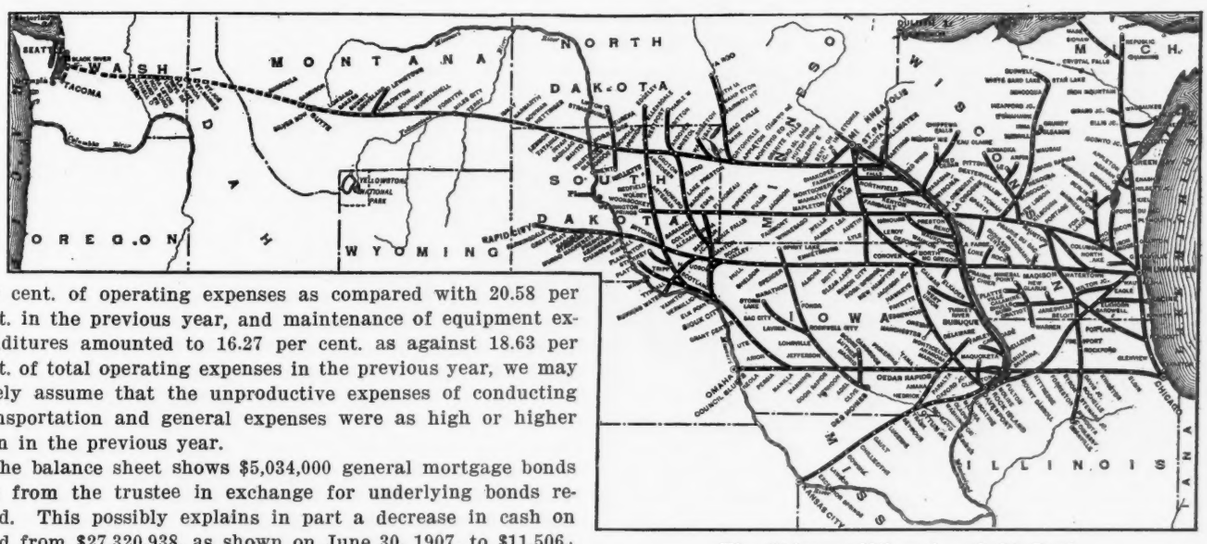
The following table shows the results of operation of the Chicago & North-Western for the last two years, the figures for 1907 having been rearranged to correspond to the form prescribed by the Interstate Commerce Commission:

	1908.	1907.
Average miles operated	7,631	7,551
Freight revenue	$41,949,630	$46,795,944
Passenger revenue	15,734,607	15,992,110
Total operating revenue	63,219,344	68,359,366
Maint. way and structures.	8,056,546	9,087,341
Maint. of equipment	6,774,950	8,225,207
Traffic	1,080,580	.....
Transportation	24,643,194	.....
Total operating expenses	41,641,314	44,162,094
Taxes	2,582,823	2,464,734
Net operating revenue	18,956,209	21,724,800
Gross income	21,866,161	24,013,071
Net income	13,638,691	15,740,566
Dividends	8,764,272	7,910,177
Surplus	4,874,419	7,830,388

CHICAGO, MILWAUKEE & ST. PAUL.

Since the close of the fiscal year ended June 30, 1908, the line from the Missouri river to Butte, Mont., has been completed by the Chicago, Milwaukee & St. Paul, and the road is now in operation. Of the remaining 650 miles between the Missouri river and Tacoma, Wash., track laying has been completed on about 250 miles. On the completion of this projected line the St. Paul will have a through road from Chicago to the Pacific, paralleling in some places, and competing in general with the Northern Pacific and the Great Northern. The extension from the Missouri river to the Pacific has been financed by the company through the issue of $66,327,100 preferred stock and $33,183,740 common stock, and on June 30 the balance sheet showed subscriptions to capital stock as $65,179,006 as against $24,692,016 on the same date 1907. This gave the St. Paul $40,486,990 in cash received during the past year; and on the other side of the balance sheet there is the item bills receivable carried at $61,060,369. On June 30, 1907, there is no item bills receivable, but an item, due from other railroads, of $32,339,271. These items probably represent the same thing, that is, advances to the Chicago, Milwaukee & St. Paul railroad companies of North Dakota, Montana, Idaho and Washington, which companies are building the Pacific Coast extension.

It will be noticed that while the St. Paul received $40,486,990



The Chicago, Milwaukee & St. Paul.

in cash from stock subscriptions during the year, it advanced to its Pacific coast extension companies but $28,721,098, and at the same time the cash on hand decreased from $18,786,945 in 1907 to $8,393,550. This leaves nearly $39,000,000 to be accounted for. Bonds and stock of other companies were carried at $4,612,448 on June 30, 1907, and at $20,020,423 on the last balance sheet. This accounts for more than $15,000,000, but unfortunately the annual report gives no detailed list of these bonds and stocks, so it is impossible to learn anything of the nature of the St. Paul's investments. There was also spent $6,577,006 for additional equipment, construction, and betterments, and charged to capital account. The stock of materials and fuel, a good part of which is probably held for the use of the Pacific coast extension, was carried at $5,989,939 in 1907 and $6,325,634 last year. There is also the item on this year's balance sheet of $2,554,355, advances to other companies, which is unexplained in the report, but probably went towards the Pacific coast extension work.

The total operating revenues were $57,956,510 last year against $60,548,554, a decrease of 4 per cent., and the total operating expenses were $38,210,167 as against $39,400,410 in the previous year, a decrease of 3 per cent.

Freight revenue, which formed 71 per cent. of the total operating revenues, amounted to $40,426,880, a decrease of over 8 per cent., and the number of tons carried amounted to 26,189,853, a decrease of also about 8 per cent. On the other hand, the number of tons of revenue freight carried one mile decreased but a little over 3 per cent. Thus the revenue per ton per mile was .8117 cents last year, a decrease of .0440 cents, and the average number of miles each ton of revenue freight was carried was 190, an increase of over 5 per cent. The average train load of revenue freight was 274 tons last year as against 279 tons in the previous year, and while the miles run by loaded freight cars decreased 4 per cent., the miles run by empty freight cars increased by 11 per cent.

Passenger revenue amounted to $11,883,395, about 2 per cent. less than in the previous year; but the number of passengers carried totalled 14,234,127, being over 16 per cent. more than were carried in 1907. Thus the revenue per passenger per mile was 1.918 cents, a decrease of about 13 per cent., and the average miles each passenger was carried was 43.52, a decrease of 3 per cent.

It is impossible to compare expenses in detail since these detailed figures have not been rearranged for the 1907 year to correspond with the form prescribed by the Interstate Commerce Commission. Maintenance of way and structures cost $6,642,820 last year as against $5,830,968, due principally to increased expenditures for renewals of ties and rails, 499,974 ties and 9,941 tons of rails having been placed in track this year in excess of the quantities used during the previous year. Maintenance of equipment cost $7,039,270 in 1908 as compared with $8,589,757 in the previous year. This decrease of $1,550,487 is due to charging to operating expenses for the previous year the cost of replacing 1,719 old cars of small capacity. The item of traffic expense was not shown separately for 1907, but most of these expenses were included, probably, in conducting transportation; so that if we add the $1,281,683 traffic expenses, and the $21,360,567 transportation expenses this year, the sum, $22,642,250, compares with $22,782,468 spent for conducting transportation in 1907. This is a decrease of $140,218. In addition to this there was $946,868 charged from operating expenses for additions and betterments in 1907, no such charge being made to this account last year.

Maintenance of way cost $886 per mile operated against $827 in 1907 and the unit costs of repairs of equipment for 1908 and 1907 compare as follows: Per locomotive, $2,109, and $2,548; per passenger car, $603 and $775; per freight car, $73 and $102. The sums spent on equipment in 1907 were much larger than those spent in 1906.

The tonnage of agricultural products amounted to 5,640,370 tons, forming 21.5 per cent. of the total number of tons carried last year, a decrease compared with the previous year of 830,545 tons, or nearly 13 per cent., while the number of tons of commodities other than agricultural products was 20,549,483 tons, a decrease of but a little over 7 per cent. Bituminous coal, the tonnage of which forms 10 per cent. of the total freight traffic, actually showed a slight increase last year over the previous year, and the tonnage of manufactures was 4,522,248 tons, only slightly less than in the previous year, and forming 17 per cent. of the total tonnage as against 16.7 per cent. in the previous year.

The extension to Butte, Mont., is now open for traffic. Merchandise is carried into Butte, and copper and ore from Butte east. More than this, there has already developed a large local business in Montana and North Dakota, which is proving exceedingly profitable. The income account of the St. Paul will not show any of the results of operation of this Pacific coast extension until the entire line is completed and taken over by the parent company, but from the traffic results of operation since the line to Butte has been opened, it is pretty safe to say that already the operated road is more than paying not only its expenses, but interest on its construction cost. This ability to pay immediate interest on its construction cost has been almost the only doubt as to the wisdom of the St. Paul's building a transcontinental line. Rails will be laid all the way to Tacoma and Seattle by some time in January, and the line should be in operation by July, 1909. This means that the Chicago, Milwaukee & St. Paul during the next fiscal year will receive no direct earnings from the Pacific extension, and will of course continue to make necessary advances to the construction companies, but it should receive, even in the present fiscal year, benefits from the traffic originating along the line of the new extension and delivered to the St. Paul. It does also at present receive the benefits of the opening up of coal fields east of Butte in the vicinity of Roundup, Mont.

The following table shows the results of operation for the last two years:

	1908.	1907.
Average miles operated.....	7,499	7,267
Freight revenue	$40,426,880	$44,115,059
Passenger revenue	11,883,395	12,102,196
Total operating revenue	57,956,510	60,548,554
Maint. way and structures.	6,642,820	5,830,968
Maint. of equipment.....	7,039,270	8,589,757
Traffic	1,281,683	.....
Transportation	21,360,567	22,782,468
Total operating expenses	38,210,167	39,400,410
Taxes	2,304,962	2,286,097
Net revenues	17,441,380	18,862,048

NEW PUBLICATIONS.

Elements of Railroad Track and Instruction. By Winter L. Wilson, Professor of Railroad Engineering, Lehigh University. New York: John Wiley & Sons; London: Chapman & Hall, Ltd. 320 pages; 5 x 7½ in; 181 figures. Cloth. Price, $2.00.

The general principles of track and of the part of railroad construction with which the young engineer may come in contact early in his experience are well and clearly presented. The book is prepared for class-room work, and in its logical arrangement builds up as clear a picture of actual conditions as definitions and accurate descriptions may.

After conscientiously giving this opinion, our thoughts turn to that able French critic, Jules Huret, who, in his "From New York to New Orleans," describes a Yale-Harvard football game, with rare appreciation of all the scene, except the sporting element; and to a still, drowsy memory of our preparatory school professors' description of the games the Greeks played. It may be that our early recollections of certain college courses have undue influence, but we used to resent, and do now resent, descriptions of our future job and explanations of the "somewhat broader life we are about to enter." Seeing is not necessary to believing, but it affects appreciation. Even "Casey at the Bat" might not be poetry to those whose tapering fingers show no marks of "daisy cutters" or drives through the infield.

Our point is that it is almost hopeless to make vivid what

a switch is to a man who has not seen a switch. And if he has seen a switch, why would it not be better exercise for him to describe it rather than read someone else's description. If a student is healthy and strong—and if he is not, his work in studying the structural part of a railroad is much discounted—he can get $1.50 a day for getting in very close touch with a switch—with ballast and with drainage.

It is the value of the accomplishment of this book that we question, not the method of accomplishing its avowed purpose. It seems a pity to divert to listed facts any more of a Lehigh man's time than is necessary to give him some thing to interpret into lines of force. The men from college whom we have known to most quickly grasp the physical part of a railroad, played around and knew the track, bridges, and the like, but studied problems. F. B.

Open and Prepay Stations, Official List of. F. A. Leland, Century Building, St. Louis, Mo.

If the complete theory on which the Interstate Commerce Commission appears to act in the matter of railroad rates is ever carried out, and especially if it shall be carried out in the spirit which seems to pervade Congress when it sets out to secure satisfactory service from the railroads, a shipper at a flag station in the remotest corner of Maine, who wishes to send a calf in a crate to Thunder Hawk, S. Dak., or Muldoon's Cross Roads, Oklahoma, will be able to learn in a jiffy the cost of transportation, the date and hour on which the freight will be delivered at destination, and everything else that he can wish for; including, probably, answers to all questions as to whether a man must be sent a part or the whole of the way to take charge of the animal, whether this man can ride in the caboose when his feet get cold, and whether or not there is anybody at Thunder Hawk to feed and water the animal, if the consignee is not on hand when the train arrives.

The work now before us, a book of 187 pages, 8 in. x 11 in., is an attempt to supply one detail of the comprehensive mass of information concerning freight shipping which the idealist would like to have always available. Mr. Leland is the authorized agent of 315 railroads, the Missouri Pacific being the most prominent, and he proposes to issue supplements to his list twice a month. The book is in substance a complete list of freight stations on the roads participating in the publication, distinctive type being used to show those to which freight must be prepaid, and notes to show where only carload freight can be taken, where only certain commodities are received or shipped, and other similar information. An alphabetical list, embracing all the stations, is printed first, and following this is a list in geographical order; that is, in the order in which the places appear on the time tables. The first list gives against each name the initials of the road, and each station has also an index number by which it can be easily found in the second list. These numbers run up to 184,965, four blank numbers being left between each two stations, in the geographical list, to provide for future additions. The publication is issued under "special permission" of the Interstate Commerce Commission and its official nature is derived from Powers of Attorney and concurrences executed by the lines parties to it. The last two annual meetings of the Local Freight Agents' Association have passed resolutions favoring a work of this kind and at the annual meeting last May of the Association of American Railway Accounting Officers, a similar suggestion was made. The Interstate Commerce Commission has refused to permit carriers to announce changes in names of stations or prepay requirements in their regular freight tariffs unless full 30 days' notice was given, but it does assent to the publication of a Station List containing only this sort of information, with the understanding that changes may be made by supplement on one day's notice. Mr. Leland says that the railroads are encouraging him and that authority for the inclusion of additional lines is being received every day. But the book has no advertisements, and nothing is said about a price; who is going to pay for it?

Letters to the Editor.

PRIVATE CAR LINES.

Pittsburgh, Pa., October 21st, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Answering my communication in your editorial in issue of October 16, you say that it "begs the question" by "arguing that private cars are not profitable."

In your previous editorial you stated that the Interstate Commerce Commission has never been suspected of being unduly friendly to private car lines. The tendency of that body has ever been towards railroad ownership of carrying facilities, as represented by cars in which the traffic of the country is moved.

How, then, do you reconcile such previous action of the Commission with the ruling in question, and which in your opinion works a hardship to such shippers of any commodity as have not sufficient capital or forethought—or both—to own their own cars?

The decision or ruling of the Commission to which you take exception was arrived at, as in all decisions of that body, after an extended period of investigation into the merits of the question at issue. The complainants, and among the more prominent of these were a number of independent oil producers and refiners, represented by the National Petroleum Association, with headquarters at Cleveland, O., were heard, both orally and also by written argument. The secretary of that association, C. D. Chamberlin, was at Washington on various occasions to personally present the arguments in favor of such a ruling.

The officers of various car service associations, representing railroad interests in Eastern, Middle and Western states, were also present at meetings of the Commission and presented the other side of the question. It is not to be assumed for an instant that any known argument in favor of charging demurrage under conditions named in the decision of the Commission to which you take exception in your editorial of October 2 would not be advanced by these various car service association officials, when they appeared before the Interstate Commerce Commission.

On the one side, therefore, we have a commission consisting of a number of well-informed and broad-minded men, whose previous tendency had been to place restrictions on private cars; and the arguments of railroad officials interested in securing the largest returns in their earning capacity. On the other side are the owners of private cars, who have made a necessary investment in order to prosecute their business successfully, and who are able to present such arguments to the Commission as reverse their former opinions. Is it not a justifiable assumption that the owners of private cars may have so much of the right on their side as to make any other ruling than the one made an injustice?

In a letter to the writer recently Mr. Chamberlin says: "Referring to the editorial in the *Railroad Age Gazette*, to which you called my attention, would say that many opinions are expressed from an ex-parte standpoint. It is always desirable that both sides of any controversy be fully heard and fairly weighed before an opinion is expressed that might influence the control of any subject.

"The question of demurrage prior to the decision rendered in our case (I. C. C. No. 933) was found to be in a state of absolute chaos, so acknowledged by the car service associations. Under such chaotic condition someone must have received injustice. While the present condition is not ideal, nor even entirely logical, it approaches more nearly to uniformity and equity. The Commission in closing its opinion in the above case made this statement: 'In expressing this opinion, the Commission is not to be regarded as bound thereby, either to the recognition of the right of a carrier to refuse to fur-

nish proper and appropriate facilities for the shipment of oil or any other commodity, or the right of the carrier to so contract with the shipper for the use of facilities as to permit any discrimination as between shippers or consignees,' and this expression seems to be in consonance with section 1 of the Interstate Commerce Act, which is declaratory of the common law, which compels all railroads to furnish all instrumentalities of transportation. Where this is not done, the owner of the instrumentality furnished in equity is entitled to a fair return for the use of such instrumentality furnished to the railroads. No reasonable return is made by them. The basis of compensation is not that accorded to other railroads on the interchange of cars. The entire subject of private cars is dealt with by railroads on the same basis of rate-making, namely, 'all the commodity will stand, and move the commodity.'

"It is the height of ludicrousness to consider that the railroad is entitled to assess demurrage against a private car on a private track, neither of which it owns, neither of which it is in any way responsible for, neither of which it assumes any liability for while so standing, and neither of which it compensates, while at the same time it has exacted its charges of freight on the same basis as though it had furnished both instrumentalities. This principle was predicated in 25 Feb. 317.

"The Commission did not go to the full logical extent urged by us in brief and argument, as shown in the closing sentence of brief filed in the above-mentioned case, Docket No. 933, which we quote. 'We claim that all the circumstances surrounding the ownership and use of the oil tank car justify the Commission in making an order that such cars be exempt from the imposition of demurrage while standing upon sidings of private ownership or of railroad ownership of private use, and that only a trackage charge be allowed the railroad companies for its detention on a public siding by consignees.'

"If the owner of the car is penalized by the railroads for being such, he certainly is entitled to all the advantages that such ownership gives him, when the rights of the public or the carrier are not thereby transgressed."

Now, so far as my begging the question is concerned, there was no such idea in my mind at the time your editorial was answered. The cars of the private car owner, engaged in the coal business, were and are used to fill the trade obligations to their customers, which otherwise could not be done if dependence were placed, at the time they were built, on the supply of cars furnished by railroad lines. Having invested so much capital in their cars, which should have been furnished by the railroads themselves, it naturally follows that the conditions under which they are operated should produce a revenue, and not be a loss to the owner. There is no other source of revenue except through the mileage earnings, and no car is earning mileage when it is held on either a railroad siding or on a private switch.

Your question as to the use of private cars on private sidings by the customer of such car owner, brings up a discussion of an entirely different phase of the subject of coal producing and marketing. It is so broad a subject that to discuss it in the limits which of necessity must be allotted to a discussion of any subject in your columns would be out of the question. Suffice it to say that the cost of operations by a large producer of coal at any one mine is proportionately greater when the owner is forced to suspend operations than where the smaller operator has a decreased tonnage. For the same reason the smaller operator is able to produce coal at less cost than his larger competitor. It is therefore necessary for the coal produced by the large producer, or car owner, if you prefer such name, to bring the highest market price. It is the price and quality of any commodity in competition with that of any similar grade of such product that sells it. This holds good, whether such commodity is coal, steel, oil, or your advertising columns as a newspaper or trade journal.

For the above reasons, as well as a number of others which might be named, the writer does not think that the private car owner could sell his coal for any given period to a customer because of his willingness to allow such customer the free and unrestricted use of his private car as a storehouse for an indefinite period. This in reply to the question you asked me direct.

The law and the Interstate Commerce Commission, to make further answer to your editorial comment, should not treat private cars that are hauled on railroad tracks by railroad locomotives just as it treats railroad cars. My reasons for differing from your views are: (1) The private car owner invests his capital in cars so moved without them costing the railroad anything, and to the exclusion of their own cars, virtually increasing their rolling stock. (2) The private car owner also furnishes the railroads their tonnage-earning revenue, not only in coal, coke, oil, grain and other similar commodities, which require no handling in transit by the railroads, but also in the higher class commodities, such as live stock and its marketable products. (3) During a time such as was experienced a few years ago, the car shortage was so great as to cause a cessation of business, numerous suits for non-delivery and such loss of revenue to a variety of interests of every description all over the country as almost produce business paralysis. What would have been the results had there not been something over 500 private car owners, owning approximately 250,000 to 300,000 cars, and costing over $200,000,000?

It must not be forgotten that the fundamental principle upon which railroad lines obtain their charters and are built is to sell transportation to the people from whom they ask for and obtain charter privileges. The present hostile attitude of the general shipping public towards railroads, and from which readers such matters of common and frequent publicity at so much adverse legislation has been the result, is due in a very large measure to an ill-advised assumption of superiority by railroad employees toward their patrons, and by immature expression of opinion by writers on subjects about which the facts are not so well known as they should be.

In conclusion, and quoting from your last editorial, if the "law and Commission do not let the railroad discriminate in the use of its plant, in order to make a profit," why are the inequalities and discriminations the daily papers give to their readers such matters of common and frequent publicity at the present time?

ROBERT J. BAILEY,
Secretary Individual Car Owners' Ass'n, of the United States.

CAR WHEEL STRESSES.

Pittsburgh, Pa., October 20, 1908.

To the Editor of the Railroad Age Gazette:

The "Know nothing" article on "Car Wheel Stresses" in your issue of October 16 is useful in showing the extent of our ignorance in regard to stresses in cast-iron wheels, and should call attention to the necessity of more thorough investigation. The author of that article, in his book on "The Car Wheel," which deals largely with the rolled steel wheel, has contributed useful data having close relation and application to the cast-iron wheel. It places in convenient shape the best knowledge we have of wheel stresses, and much of this is the direct result of experiments and investigations made by Mr. Fowler. It is encouraging to learn that our ignorance in regard to flange resistance due to side bearings may be cleared up during the next few months, and some definite knowledge will be obtained as to the influence of center plate and side bearing friction on flange wear and wheel pressure.

It is probable that this contribution will be made by the M. C. B. committee on side bearings and center plates, which is instructed to make laboratory tests of the friction of side bearings and center plates, and also to investigate their resistance on curves in regular service. The responsibility of continued ignorance in regard to this part of wheel stresses, there-

fore, rests with this committee, and I believe that the committee's investigation will do much to enlighten us.

The list of things we do not know about wheel stresses is large enough, without including the stress due to the shrinkage of the tire. Mr. Fowler says, in the article referred to, "A steel tire shrunk upon a center is under a tensile stress, but how much this amounts to we do not know." We ought to be able to approximate very closely what the stress in a tire is, due to shrinkage, at least the maximum stress, if the diameters of tire and center are accurately measured. The formula used for the shrinkage of gun tubes ought to apply, and the large amount of experience in the manufacture of guns and their safety when proportioned to formulæ should teach us something. The Master Mechanics' standard shrinkage for tires below 66 in. is 1/80 in. per foot, and the unit elongation in terms of the diameter is 1/960. The modulus of elasticity, E, for tire steel may be taken at 30,000,000, and

$$E \text{ equals } \frac{\text{unit stress per sq. in. in pounds}}{\text{unit stretch or elongation in inches}} \text{ or } E \text{ equals } \frac{S}{L} \text{ and}$$

S equals E L. The stress then due to 1/80 in. shrinkage per foot is 30,000,000 x 1/960, or 31,250 lbs. per sq. in. This is true for the inner surface of a tire of any diameter, and for the outer diameter the stress is proportional to the square of the diameter, or radius. For a tire 42 in. outside and 3 in. thick we have the relation 21 : 18 :: 441 : 324 and $\frac{31{,}250 \times 324}{441}$ = 23,000 lbs.—the stress in outer fibre of a 42-in. tire. The average stress is 27,000 lbs., and, as the elastic limit of tire steel is 50,000 to 60,000 lbs., it is well within a safe limit. The figure thus found is higher than the actual stress, as no account has been taken of the compression of the wheel center, but the stress as figured indicates the maximum stress possible due to shrinkage, which is really what we want to know.

S. M. P.

This calculation is the one ordinarily used for the approximate determination of tire stresses, but can hardly be relied upon for the refinements of accuracy. It would be all right if there was no yield to the center when the tire was applied, but there is undoubtedly such a yield, as shown by the behavior of certain driving-wheel centers when the shrinkage allowance is excessive, so that if the yield of the center is one-half of the shrinkage allowance, or 1/160 in. per foot of diameter, the tire stress is but one-half what it would be were the center to remain rigidly of its full diameter; a possible variation too great to be considered a negligible quantity. As far as known, no determinations have ever been made of this matter, and until they are made it looks as though our ignorance of just what tire stresses are would be pretty nearly absolute.—EDITOR.

Contributed Papers.

NEW LACKAWANNA STATION AT SCRANTON.

The Lackawanna has just completed its new passenger station at Scranton, Pa. The material of the exterior is Indiana limestone, with six engaged columns for the central feature. The station building itself is 250 ft. long and 80 ft. wide. It is five stories high, built of fireproof brick and steel construction, with concrete floors and partitions.

Scranton Passenger Station; Delaware, Lackawanna & Western.

This station is designed to serve the eastbound and westbound tracks of the main line, and is also the terminus of the Bloomsburg Division. It is approached by Spruce street, Lackawanna avenue, and Jefferson street, at the junction of which is a triangular plaza immediately in front, block-paved, and is defined by an ornamental classic balustrade. The style of the architecture is French Renaissance; the design of the building being very expressive of the purpose for which it is intended. By reference to the accompanying illustration, showing the front elevation, it will be seen that the station is surrounded on three sides by a continuous marquise to afford shelter over the entrances and sidewalk. This marquise is 20 ft. wide. The central and predominating feature of the facade is a large bronze clock, whose dial measures some 8 ft. in diameter. There are six massive columns over the main en-

trance, and the plaques above are of heavy vein Italian statuary marble.

Upon entering the main waiting room from the street, the offices of the ticket agent, news agent, and telegraph are directly opposite, facing on the train concourse. At the east end of the waiting room is the lunch room and main dining room, adjoining which is a commodious serving room and a modern hotel kitchen. Upon the east side of the waiting room is the women's retiring room and men's smoking room, with spacious lavatories and public telephone booths. At the west end of the waiting room is an additional exit passage, provided to relieve the traffic between the street and train concourse. West of this passage is the main baggage room, hand baggage room, transfer agent and station master. Beyond the main baggage room is the loading platform, which is so located that it can be readily approached by teams from Lackawanna avenue.

The main entrance, leading to the main waiting room, is furnished in Formosa, a soft, pinkish-yellow, Italian marble. The waiting room itself is gorgeous in its profusion of imported marbles. Perhaps the most striking decorative feature of this room is the series of 36 faience panels in colors after the painting of Clark G. Vorhees, the well-known landscape artist. These panels were reproduced in color direct from nature and represent actual scenes along the line of the Lackawanna Railroad. They are framed in white Italian statuary marble. This is the first time that faience has ever been used by a railroad company as a scheme of decoration portraying scenes along its line. The Gare d'Orleans, the newest and finest railroad station in Paris, has mural paintings representing various scenes along its line, but, in the case of the Scranton station, the Lackawanna deemed it wiser to have its

Exit to Concourse.

Restaurant; Lackawanna Station at Scranton.

art treasures constructed of a more imperishable material. The base of this room is finished to the height of a foot or more in Alps green, a beautiful Swiss marble. The 28 stately pilasters about the room are of light Sienna, an Italian marble of an artistic shade of buff or yellow. The panels between are of Breche Violette, an Italian marble. In color, it is a marvelous combination of purple and white, as its name indicates. A striking feature of this latter marble is its weird and wonderful markings. It requires very little effort of the imagination to discover fancied resemblances to various objects in nature. The architect states that, when the building was in the process of construction, the workmen were constantly calling his attention to these resemblances. There is something weird and uncanny in their extraordinary fidelity to nature. With very little effort, one can discover numerous faces of men and women, a bear, a dog, and the likenesses of two men facing each other. The workmen called these portraits, "The Two General Contractors." There is also a striking resemblance to a Gibson girl, or, possibly nature, with a view to the eternal fitness of things, intended it as a portrait of Phoebe Snow. Above the cornice, surmounting the walls, is a very ornamental railing of bronze, in the center of which is a large bronze clock in perfect harmony with the spaciousness of the room.

The room is lighted in the day time by a ceiling of leaded glass, and at night by lights concealed behind a cornice surrounding it. This ceiling light is what is termed a barrel vault, and is highly ornamental. An ingenious scheme has been devised for lighting the faience panels at night. The architrave projects slightly and renders invisible the source of the ample flood of light from behind.

In the waiting room, ventilation is effected by openings framed in copper ribs, which span the vault about every 15 ft. Throughout the remainder of the station, the principal rooms are ventilated by a mechanical forced-draught system, insuring an abundant supply of fresh air at all times.

Three electro-bronzed iron vestibules lead from the waiting room to the concourse. In the latter, as well as in the exit passages, for hygienic and sanitary reasons, green Gustavino tile is very extensively used. The four upper floors surrounding the enclosed court and extending from the main waiting room on the ground floor to the stained glass vault above, are occupied by the division and a portion of the general office force. One room, comprising the entire top floor, is occupied by the department of Auditor of Freight and Ticket Accounts. This room has accommodations for 210 employees. It is admirably lighted by skylights and windows.

The station is equipped with the Bush train sheds of the same type as that employed in the company's Hoboken terminal. Kenneth Murchison, of New York, is the architect; Edward Langley, of Scranton, the resident architect, and Lincoln Bush, Chief Engineer of the Lackawanna, designer of foundations and train sheds.

Interior of Waiting Room.

FOREIGN RAILROAD NOTES.

The freight charges on the rails for the railroad along the upper Congo above Stanleyville were about $50 per ton, going by sea from Antwerp to the Congo Railroad, over the 250 miles of this railroad, and then by steamboat up the river about 1,000 miles.

The Prussian Railroad Minister has asked various "directions" of the State Railroads to make investigations and ascertain whether and to what extent it will be possible to give employment to laborers who have been left without work by

the decrease in the activity of other industries. A considerable amount of reconstruction has been provided for.

Employees of a railroad in Asiatic Turkey have combined and demanded higher wages and the removal of the General Manager.

The Russian Minister of Finance has officially declared that the finances of a large number of the Russian railroad companies are in deplorable condition, and that some of them are on the verge of bankruptcy.

The Tsinpu Railroad, of China, has, according to a consular report, decided to use only Manchurian wood for ties on the road from Tientsin to the Yangtze river. It is said that a German firm had been figuring on a contract for steel ties for this road.

A contributor to the journal of the German Railroad Union claims for the Buenos Aires & Pacific Railroad the longest tangent in the world—no less than 205½ miles, beginning at a point 158 miles west of Buenos Aires. There were formerly two curves on this stretch to get around a shallow lake. This lake has been drained and the line now goes directly through its bed. The long tangent has been in operation since Oct. 7, 1907.

FOREST FIRES.*

The task before us is to formulate plans for putting a stop to all forest fires for which the railroads are responsible. The state is not singling out the railroads to find fault with, for our records show that about 60 per cent. of all the forest fires in the state are due to the carelessness of settlers in burning brush to clear land and make pasture, while 10 per cent. are traceable to the railroads.

Forestry is the systematic management of forests, to obtain successive crops of timber, while the general practice among lumbermen only a few years ago was to treat the forest as if it were a crop which could only be harvested once. In the lumbering operations only the best trees were taken, often only one log in a tree, and the fires which followed in the tops and limbs (called the "slash") left on the ground were so severe that the timber which had been left standing was destroyed, and all ground cover including the leaf mould, consumed; then the land was abandoned—often in almost the condition of a desert—for the settler who followed the lumberman, and attempted to farm such lands.

Forestry removes only the timber which is full grown, piles and burns the slash when it can be safely done, and leaves the young timber in good condition to produce a second crop.

The destruction of the forests of the United States has been upon an enormous scale, and at last the whole country seems to be aroused to the urgent necessity of protecting the timber which is left. The National Government has about 160,000,000 acres included within the national forests, mostly in the far western states, and in these forests the cutting is done *carefully*, which means that in the years to come "Uncle Sam" will be able to supply an enormous amount of timber to the people of those sections, and receive great revenues as well. But large as these national forests are, it must be remembered that they are practically all in the far west, and are not nearly large enough to supply the whole country with timber. The eastern, southern and central western states must look out for themselves.

Some years ago New York set the example by starting to acquire a forest reserve, which has now grown to 1,500,000 acres. Pennsylvania comes second with 700,000 acres, which is only a small part of what she should own in order to prevent the fearful floods in that state, caused by the destruction of forests. I am glad to say that Wisconsin now ranks third with over 300,000 acres in the forest reserves, most of which are in Oneida and Vilas counties.

I have appointed over 300 town fire wardens in the northern part of the state. These men are paid by the towns in which they serve for the time actually employed in preventing and fighting forest fires, posting the laws, etc. They have the power to call upon any citizen for aid in case of a fire, have the power of sheriffs to arrest without a warrant, and can absolutely forbid the setting of any fires in a dangerously dry time. They are doing a great deal of good in stopping fires before they gain a strong headway, but still more in arousing public opinion against the criminal loss in forest fires and to the value of the young growth which is coming up on cut-over lands.

The law requires that locomotives be provided with nettings, so that sparks or cinders cannot escape. Our inspector, who is here to-day, and who is examining all locomotives in use in the northern part of the state, sometimes finds holes in the front end and ashpan nettings, and often notes that the ashpan nettings are too light to stay down in place or hold their shape. The nettings are not the most serious matter, however, but rather the holes around the steam pipes, standpipe, blower, pump exhaust, and around the edges of the smokebox and deflector plate. Such holes in many cases are big enough to let large sparks escape, and they are sometimes "repaired" by driving in spikes. Head ends are supposed to be frequently inspected by the railroads but often this is a farce, as the inspector looks in through the peephole, and, as you know, the inspection cannot be done properly without opening up the front end. The railroads should co-operate with the state in this work and have a man in each roundhouse to devote all his time to inspecting engines and see to it that they are in perfect condition. An engine which throws sparks or drops hot coals along the right of way in dry weather is too dangerous a thing to be allowed in the timber regions of northern Wisconsin.

Train crews, when they find a fire burning on or near to the right-of-way, should make it an absolute rule to notify the agent or operator at the next station, so that the nearest section crew can be sent to the fire at once. Fires set by the engines are due to a very large extent either to the failure of section crews to keep the right-of-way free from grass and weeds, or to their failing to cut them until late in the summer, when the grass and brush outside the right-of-way are dry, so that a fire will spread rapidly unless very carefully watched. Grass and weeds should be cut from about the 15th of July to the 1st of August, when the farmers are haying and fires will not run. Care, of course, should be taken not to do this work too early, for then a second cutting will be necessary, but, on the other hand, some section men leave this work until well into September, which is very dangerous, for as a rule the adjoining forests and fields are extremely dry and a destructive forest fire is only too likely to occur.

Another cause of fire along the railroad lines, which seems absolutely unnecessary, is the burning of old ties during the dry summer months. I have taken this matter up with the railroads several times and have always asked that no ties should be burned until after snow falls, so that the fire could not spread. A pile of old ties, as you know, makes a very hot fire, and a slight wind is apt to carry sparks to adjoining dry grass or timber. Where fires are not allowed to run, pine will always follow pine and if any of you will take the trouble to walk through the popple growth which is coming up on the cut-over and burned-over land, you will find thousands of young white and Norway pines coming up. Many of them may be only a few inches high, but finally they will overtop the popple, and form fine forests—if we can only keep the fires out.

*From a paper by E. M. Griffith, State Forester of Wisconsin, before a meeting of section men and operating officials of the Chicago & North-Western, at Antigo, Wis.

METHOD OF REPORTING AND STUDYING RAIL FAILURES ON THE HARRIMAN LINES.

A systematic plan of reporting and studying rail failures was put into effect on the Harriman Lines in 1907. At the meeting of the rail committee of the American Railway Engineering & Maintenance of Way Association held in Pittsburgh on October 5, J. D. Isaacs, Consulting Engineer of the Harriman Lines, read a paper outlining the methods followed on these lines, the purpose of the paper being to indicate to the committee what was considered a desirable plan for studying statistics of rail failures. The following is taken from Mr. Isaacs' paper:

But two report forms are in use. The section foreman's form, No. 2,658, is used as follows: When a broken or failed rail is found, the section foreman fills out this form and forwards it to the roadmaster. The latter certifies to the report, makes a press copy of it, and sends it to the division engineer, who in turn takes his record therefrom and transmits the form to the division superintendent. At the same time that the section foreman makes out his report, the broken or failed rail, when removed from the track, is marked with white paint, showing from which section taken, the location by mile post or station and plus, also weight and brand of rail. All broken and failed rails and the pieces thereof are sent to a division terminal, the division terminals being central and convenient points for inspection and taking samples. The roadmaster or other engineer whose business it is to inspect these rails is furnished with copies of the superintendent's report of broken or failed rails, hereafter referred to, in order that these rails may be identified and properly re-inspected by him, and such corrections made in the foreman's report as may be necessary. Borings are made from at least 10 per cent. of the broken rails in accordance with the footnote on Form 2,736. These borings, properly marked, are sent to the general officer in charge of maintenance, who transmits them to the engineer of tests through the superintendent of motive power. The foreman's reports are held in the division superintendents' offices until the end of the month, when a general report is made by each division superintendent on Form 2,736, embodying all the information on the foremen's reports. This division superintendent's report includes all the information in columns 1 to 15 inclusive, also in columns 18 and 21. The division superintendent's report is transmitted to the chief engineer, or other general officer in charge of maintenance, in whose office columns 16, 17, 19 and 20 are filled out. The engineer of tests, through the super-

(FORM 2658.)

FOREMAN'S REPORT OF BROKEN OR *FAILED RAILS.

.....Division.

.....190....

.....District on Sec. No. ....

Between Mile Post .... and ....

Discovered .....190....

at .... o'clock .... M.

By .....

1. Brand in full .....
2. Weight of rail per yard.....
3. Whole length of rail.....
4. Lengths of pieces .....
5. Were pieces in or out of place. .....
6. Was rail battered at break.....
7. Was break on or between ties.. .....
8. What train broke rail.....
9. What accident resulted from break .....
10. Cause of removal (if broken rail, supposed cause of breaking) .....
11. Suspended or supported joint. .....
12. Anglebar, fishplate, or continuous joint .....
13. Was rail battered, or split at joint .....
14. Was rail near station or stopping point .....
15. North or south rail.....
16. On curve or tanget .....
17. Was rail well surfaced and lined .....
18. Was rail full spiked.....
19. Kind and condition of ties.. .....
20. Kind and condition of ballast .....

Remarks .....

..... Roadmaster

..... Foreman.

NOTE.—* FAILED RAIL is any rail removed for cause from main track within five years of time it was laid or BRANDED.

Fill out above form in copying ink, fold lengthwise, and forward by first train to Roadmaster.

Roadmasters, please take impression for your record, endorse, and forward this report to Superintendent of your division.

(FORM 2736)

STATEMENT OF BROKEN OR FAILED RAILS.

Period ending .....190....

Name of road.	Division.	Location mile post or Sta.	"T" tangent, "C" curve degree.	Failure: Date.	Failure: Cause.	Failure: Longitudinal or cross break.	Failure: Description.	Length: Original.	Length: Broken pieces.	Weight.	Section.	Brand: Mill.	Brand: Heat No.	Brand: Year.	Inspected by.	How long in track, Yrs. & Mos..	Disposal of broken p'ces.	Etching or sketch No.	Chemical analysis. —20— C	P	Si	Mn	S	Tonnage.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19						21

1. DESCRIBE BREAKS (Column 8) AS FOLLOWS:

1a. LONGITUDINAL BREAKS:—Whether split ball, split flange, split web; piece broken out of ball, flange or web; piped material; old cracks.

If observable cause other than those above, note same; if not observable cause, state "Unknown."

1b. CROSS BREAKS:—Piped section; glassy section, indicating brittleness; granular section, indicating short fiber; flaws; old cracks.

If observable cause other than the above, note same; if no cause observable, state "Unknown."

1c. BATTERED:—Battered ends; bent over sideways, or otherwise distorted; corrugated ball.

2. ANALYSIS, Column 20.

Have borings made from about 10 per cent. of broken rails at break, selecting pieces indicating brittle or soft structure, provided there should never be less than six samples taken, should so many rails be broken. These borings should be sent to the Engineer of Tests. Upon receipt, the Engineer of Tests will make analysis showing the following chemical characteristics, in the following order:

1. Carbon, per cent. (designated as C).
2. Phosphorus, per cent. (designated as P).
3. Silicon, per cent. (designated as Si).
4. Manganese, per cent. (designated as Mn).
5. Sulphur, per cent. (designated as S).

The results of these analyses are to be entered in Column 20.

3. ETCHINGS:—Select six broken rails (should there be so many broken) showing typical breaks, such as pipes, splits, hard or coarse fiber. From each rail, saw off short samples, so as to give a complete cross-section at one end of the sample; forward these samples to the Engineer of Tests for etching and analyzing. Upon receipt, Engineer of Tests should etch the samples and make prints therefrom, and attach to each print a complete analysis of borings from the same test piece, as directed in clause 2. The etchings should be identified by suitable note designating the broken rail from which taken.

4. DISPOSAL OF BROKEN PIECES, Column 18: State whether used in track, or sent in to Store Department for future claims.

5. Give total number of rails of each section in track within the district for which failed rails are given, so that computations can be made of ratio of failed rails to total number of rails in use of same section in same district.

6. TONNAGE, Column 21:—Give total tonnage carried by failed rails to date of failure, in units of one million tons.

REMARKS: .....

.....

.....

intendent of motive power, sends to the chief engineer, as above, the information necessary to fill out columns 19 and 20. The chief engineer's report is forwarded either directly to the general manager, or through the general superintendent to the general manager, and thence to the office of the consulting engineer.

These reports, which will in future be slightly modified so as to include a statement as to whether a broken rail from a curve was on the inside or outside of the same, and from what portion of the ingot rolled, are thought to include all the information necessary or desirable to be given regarding the facts connected with broken or failed rails from the time they are discovered in the track until a complete report is filed.

Upon receipt of this information the consulting engineer makes a monthly report to the director of maintenance and operation, consisting of two parts: First, a statement of broken and failed rails, giving the railroad, the number of failed rails and the number of failures per 100 miles of track,

TABLE I.

Broken or Failed Rails on Harriman Lines for Month of June, 1908.

Railroad.	Defective 75-lb.	Defective 80-lb.	Defective 90-lb.	Other causes 75-lb.	Other causes 80-lb.	Other causes 90-lb.	No. of failures.* 75-lb.	No. of failures.* 80-lb.	No. of failures.* 90-lb.
V	1	8	20	..	19	2	0.40	2.78	3.77
W	..	..	..	..	2	..	....	0.26	....
X	1	2	..	..	..	..	0.21	0.48	....
Y	..	5	..	2	3	..	0.36	0.76	....
Z	33	5	..	14	7	..	3.80	0.85	....
All lines	35	20	20	16	31	2	1.82	1.10	2.71
Percentage of failures due to defects, per cent..	69	40	91	..	..	..	....	....	....

Percentage of failures of all weights due to defects, 60 per cent.

Broken Rails of Different Manufacture, on all Lines, June, 1908.

Name of manufacturer.	75-lb. Miles.	75-lb. No. brks.	75-lb. Per 100 miles.	80-lb. Miles.	80-lb. No. brks.	80-lb. Per 100 miles.	90-lb. Miles.	90-lb. No. brks.	90-lb. Pr 100 miles.
A	1,909.5	44	2.3	1,321.4	15	1.1	323.8	0	0.0
B	320.2	0	..	1,351.2	12	0.9	267.2	7	2.6
C	260.6	1	0.4	1,057.8	18	1.7	131.5	1	0.7
D	76.5	4	5.2	120.9	0	...	15.8	0	0.0
E	45.3	1	2.2	....	..	...	....	..	.....
F	6.1	0	0.0	303.5	2	0.7	55.8	0	0.0
G	79.1	0	...	22 5	0	...	.....	..	.....
H	.....	..	...	417.7	2	0.5	.....	..	.....

*Per 100 miles of track of given section.

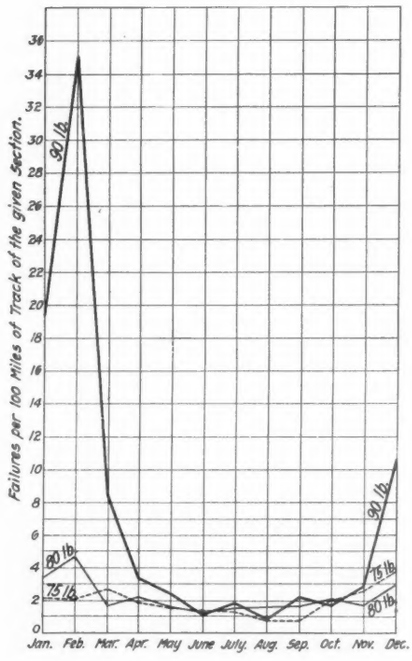


Diagram 1—Rail Failures on the Harriman Lines for 1907, by Months.

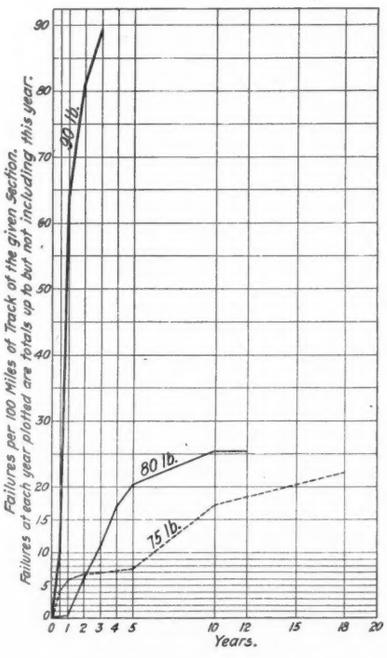

Failures per 100 Miles of Track of the given Section.
Failures at each year plotted are totals up to but not including this year.
90 lb.
80 lb.
75 lb.
Years.

Diagram 2—Life of Rails Which Failed on All Lines During 1907.

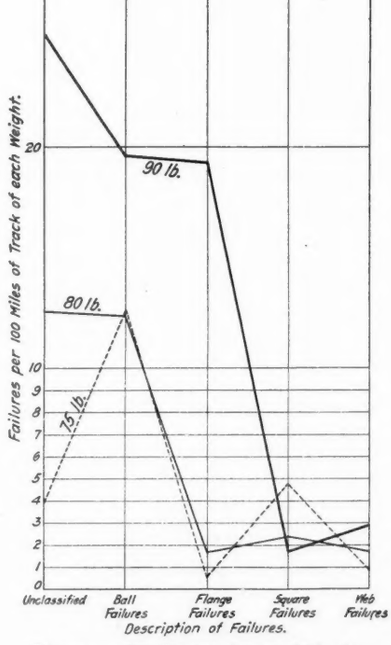


Diagram 3—Percentage of Various Breaks Per 100 Miles of Rail in Track.

the percentage of failures of each weight due to defects, and the percentage of failures of all weights due to defects. The second part is the same information segregated as to the name of the manufacturer or rolling mill in which these rails are made. The accompanying figures (Table I.) are the actual report for the month of June, 1908, with the names of the railroads and those of the manufacturers indicated by letter.

For the year 1907 all these monthly reports have been collected, tabulated, and put into the form of charts, bound together, with a statement of conclusions, for convenient reference and study. Hereafter, this information will be collected at intervals of six months, instead of yearly; and the charts made out not only for the individual half years, but also yearly for all preceding years back to and including 1907.

From the diagrams and facts presented, the principal factors in rail failures on these lines appear to be: (1) Cold weather. (2) Ninety-lb. section. (3) Newly laid rails. (4) Balls and flanges of 90-lb.; ball of 75 and 80-lb. (5) Excess of phosphorus. (6) Ninety-lb, manufactured by "A" steel company; 75-lb. manufactured by "D" and "E" companies.

Special attention is directed to the fact that the number of failures of the 90-lb. section per 100 miles of track is much greater than the 75 and 80 under the same tonnage, and that 77 per cent. of the failed rails which were analyzed contained phosphorus in excess of .085 per cent.

Diagram No. 1.—This diagram shows the distribution of total rail breakages for all lines for the year 1907 with respect to the various months. In February, for example, it shows that there were 35 broken 90-lb. rails for each 100 miles of this section in the track; 4.7 broken 80-lb. rails per 100 miles in the track, and 2.1 broken 75-lb. rails per 100 miles in the track. The diagram indicates that for all weights of rail, and more especially for the 90-lb. section, the larger number of breaks took place during the colder months of the year.

Diagram No. 2.—This diagram, which is made from Table 2, shows the life of 75, 80 and 90-lb. rails which failed on

all lines during the year 1907. It shows 80.9 broken 90-lb. rails lasting less than two years for each 100 miles of 90-lb. rail in the track; 6.1 broken 80-lb. rails lasting less than two years for each 100 miles of 80-lb. rail in the track, and 6.6 broken 75-lb. rails lasting less than two years for each 100 miles of 75-lb. rail in the track.

TABLE II.—*Failures on All Lines During* 1907.

Life.	Failures per 100 miles for given life 75-lb.	80-lb.	90-lb.
Less than 6 months	4.40	0.10	10.73
" " 1 year	5.74	.43	61.91
" " 2 years	6.61	6.11	80.94
" " 3 "	6.94	10.76	88.90
" " 4 "	7.15	16.80	.....
" " 5 "	7.56	20.26	.....
" " 10 "	17.18	25.24	.....
Over 10 years	22.13	25.26	.....

The diagram indicates that for the rail breakages for 1907 the majority of 90-lb. breakages were of rails less than one year old; it shows very few 80-lb. rail breakages of rail less than one year old, but shows a large number of 80-lb. breakages between the ages of one and four years. A large number of broken 75-lb. rails were less than six months old. Very few of the 75-lb. rails broken were between one and five years old, the greater number of breaks being of rails from five to ten years old.

The table takes no account of the relation of the breakages to the number of new rails laid, but simply indicates the life of the broken rails during 1907. It clearly indicates that the 90-lb. rails are failing at a considerably greater rate than either the 80 or 75-lb., and that there was a greater percentage of 80-lb. broken rail less than five years old than of 75-lb.

Diagram No. 3.—This diagram shows the failures of various descriptions for the 75, 80 and 90-lb. rail per 100 miles of that weight of section in the track. For example, there were 19.6 ball failures of 90-lb. rail for each 100 miles of these rails in the track; 12.4 ball failures of 80-lb. rail for each 100 miles in track; and 12.7 ball failures of 75-lb. for each 100 miles in track.

Table 3 shows the ball failures of the 90-lb. rail to be considerably higher than the 75 and 80-lb. rail, which are about the same. The flange failures for 90-lb. rail are ten times as high as the flange failures for 80-lb. rail, and 40 times as high as failures for 75-lb. rail, which, with Table 4, seems to point decidedly to a brittleness or weakness in the flange of the 90-lb. rail.

TABLE III.—*Failures on All Lines during* 1907.

Description.	75-lb. No.	Per 100 mls.	80-lb. No.	Per 100 mls.	90-lb. No.	Per 100 mls.
Unclassified	92	4.0	498	12.6	190	25.2
Ball failures	295	12.7	489	12.4	148	19.6
Flange failures	12	0.5	66	1.7	146	19.3
Square breaks	113	4.8	93	2.4	13	1.7
Web failures	21	0.9	66	1.7	22	2.9
Total	533	22.9	1,212	30.9	519	68.7
Miles in track, December 31, 1907	2,326		3,941		756	

TABLE IV.—*Phosphorus Content—Failures on All Lines for* 1907.

Per cent. phosphorus:	No.	Failures.	Per cent.
Not exceeding .085 per cent.	91	91	23
" " .100 "	106	197	50
" " .120 "	106	303	77
Over .120 per cent.	89	392	100

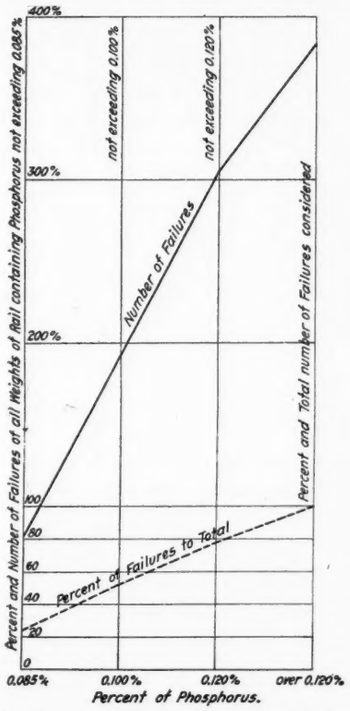

Percent and Number of Failures of all Weights of Rail containing Phosphorus not exceeding 0.085%
not exceeding 0.100%
not exceeding 0.120%
Number of Failures
Percent of Failures to Total
Percent and Total number of Failures considered
Percent of Phosphorus.
0.085%
0.100%
0.120%
over 0.120%

Diagram 4—Phosphorus Content of Failed Rails Which Were Analyzed.

Includes 392 *Broken-rail Analyses.*

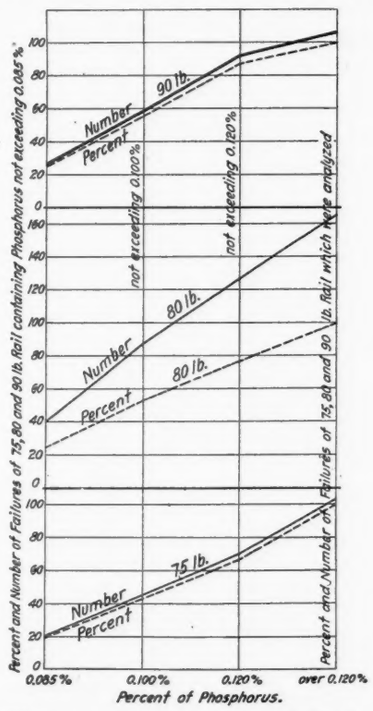


Diagram 5—Phosphorus Content for Different Weights.

Includes 103 *Failed* 75-lb. *Rail Analyses.*
" 165 " 80-lb. " "
" 106 " 90-lb. " "

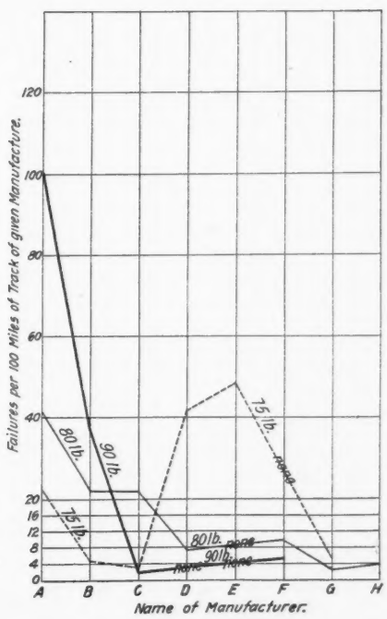


Diagram 6—Failures Segregated as to Different Makers.

"None" indicates that there was no appreciable amount of this make and weight in track.

The square breaks are comparatively low for all three sections, although they are highest on the 75-lb., which would seem to be consistent, as the 75-lb. is a weaker structure than the 80 or 90-lb. The web failures are comparatively low for all three sections. The unclassified failures are very high on the 90-lb.

Diagram No. 4.—This diagram shows the phosphorus content for all weights of rail for all broken rails analyzed during the year 1907 for all lines. Out of 392 broken rails analyzed, but 91, or 23 per cent., fulfilled the requirements for phosphorus, containing less than .085 per cent.; 197, or 50 per cent., had phosphorus less than .100 per cent.; 303, or 77 per cent., contained less than .120 per cent., and 89 failures contained phosphorus over .120 per cent.

Diagram No. 5.—This is the same as Diagram No. 4 except that the weights of rails are segregated. Of 103, 75-lb. broken rails analyzed, but 20, or 19 per cent., contained the required amount or less of phosphorus (.085 per cent.). Of

the 165, 80-lb. broken rails analyzed, but 40, or 24 per cent., fell within the phosphorus limits required. Of the 106, 90-lb. broken rails analyzed, but 26, or 25 per cent., fell within the required limits for phosphorus.

Diagrams Nos. 4 and 5 taken together show that the phosphorus content in a majority of the rails was excessive. But it does not show any particular section having an advantage in this respect. It might be inferred from this that excessive phosphorus may not be the explanation of the greater number of breakages in the 90-lb. rail.

TABLE V.

Per cent. phosphorus:	75-lb. No.	75-lb. Per cent.	80-lb. No.	80-lb. Per cent.	90-lb. No.	90-lb. Per cent.
Not excdg .085 pr ct..	20	19	40	24	26	25
" .100 " .	25 45	44	47 87	53	32 58	55
" .120 " .	25 70	68	40 127	77	34 92	87
Over .120 per cent...	33 103	100	83 165	100	14 105	100
Total	103		165		106	

TABLE VI.—*Broken Rails of Different Manufacture on All Lines*, 1907.

Name of manufacturer.	75-lb. Miles.	75-lb. No. brks.	75-lb. Per 100 miles.	80-lb. Miles.	80-lb. No. brks.	80-lb. Per 100 miles.	90-lb. Miles.	90-lb. No. brks.	90-lb. Pr 100 miles.
A	1,847.0	428	23.2	1,312.0	550	42.0	337.5	343	102.0
B	256.7	12	4.7	1,330.0	293	22.0	278.6	105	37.3
C	154.1	5	3.3	1,112.0	245	22.0	115.4	3	2.6
D	43.65	18	41.3	120.9	9	7.5	8.0	0	....
E	45.33	22	48.5	0.0	2	...	0.0	0	....
F	6.12	0	....	300.9	29	9.7	55.8	3	5.4
G	41.01	2	4.9	77.80	2	2.6	0.0	0	....
H	0.0	0	...	423.7	16	3.8	0.0	0	....

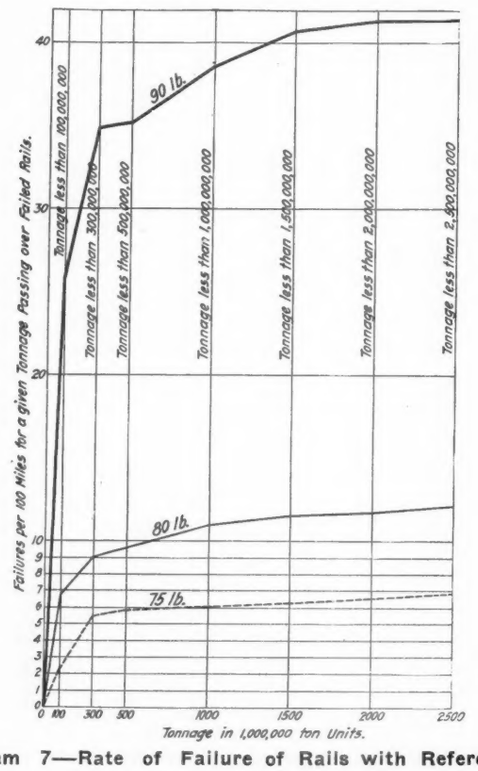

Failures per 100 Miles for a given Tonnage Passing over Failed Rails.
Tonnage less than 100,000,000
Tonnage less than 300,000,000
Tonnage less than 500,000,000
Tonnage less than 1,000,000,000
Tonnage less than 1,500,000,000
Tonnage less than 2,000,000,000
Tonnage less than 2,500,000,000
90 lb.
80 lb.
75 lb.
0 100 300 500 1000 1500 2000 2500
Tonnage in 1,000,000 ton Units.

Diagram 7—Rate of Failure of Rails with Reference to Tonnage Passing Over Them.

Diagram No. 6.—This diagram shows the number of breaks per 100 miles of 75, 80 and 90-lb. rail, segregated as to different manufacturers. Too much dependence cannot be placed upon this diagram owing to the wide variation in mileage of the different makes, in most cases the larger number of breaks per 100 miles occurring in the weight and make where the mileage is the largest. Seventy-five-lb. rails from manufacturers "D" and "E" show a high percentage of breaks, but there are only 43 miles of "D" 75-lb. rails and 45 miles of "E" 75-lb. rails in the track, as against 1,847 miles 75-lb. "A."

Of the 90-lb. rail there are 337.5 miles of "A," 278.6 miles of "B," and 115.4 miles of "C," so that these may very well be compared. The diagram shows that during the year 1907 there were 102 breaks per 100 miles of "A" rail, 37 of "B," and but 2.6 of "C." The low breakage of the "C" is doubtless due to the fact that the majority of this rail was laid in the latter part of the year 1907 and had had very little usage during the year. The fact that these 90-lb. rails from "C" were open hearth steel, while those from "A" and "B" were Bessemer, may have some bearing in this matter, but the rails have been in service too short a time to draw any definite conclusions.

TABLE VII.—*Failures on All Lines During* 1907, *for Given Tonnage.*

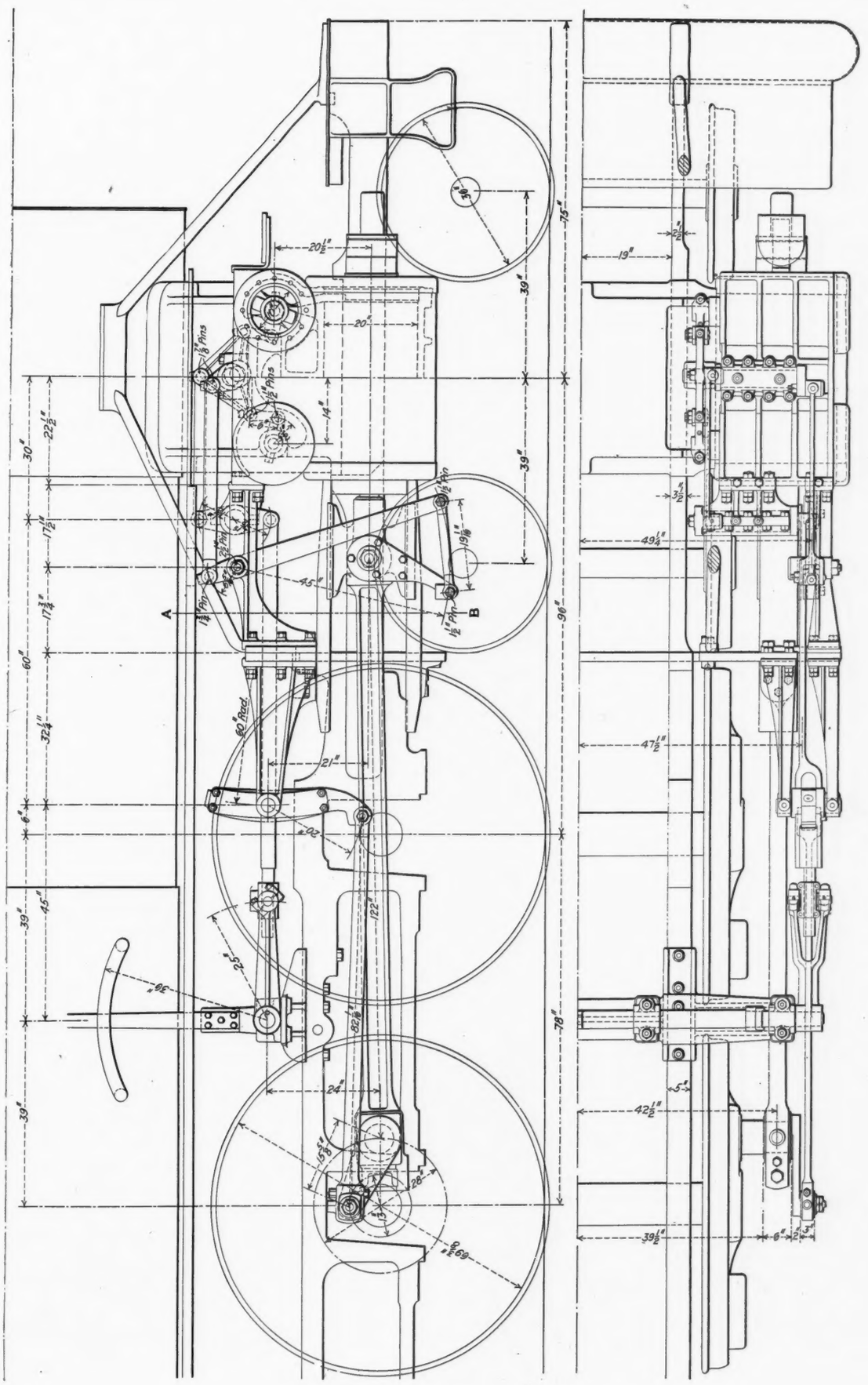
Tonnage, 1,000,000 ton-units.	75-lb. No.	75-lb. Total.	75-lb. Per 100 miles.	80-lb. No.	80-lb. Total.	80-lb. Per 100 miles.	90-lb. No.	90-lb. Total.	90-lb. Pr 100 miles.
Less than 100.....	54	54	2.3	266	266	6.8	197	197	26.1
100 to 300.....	74	128	5.5	93	359	9.1	67	264	34.9
300 " 500.....	9	137	5.9	20	379	9.6	2	266	35.2
500 " 1,000.....	5	142	6.1	55	435	11.0	26	292	38.6
1,000 " 1,500.....	3	145	6.3	22	457	11.6	16	308	40.8
1,500 " 2,000.....	9	154	6.6	8	465	11.8	5	313	41.4
2,000 " 2,500.....	5	159	6.9	16	481	12.2	0	313	41.4
Mileage, Dec. 31, '07		2,326			3,941			756	

Diagram No. 7.—This diagram shows the rate of failure of the rails with reference to the tonnage which has passed over them.

If the rails were acting properly, that is, were wearing out, the rate of breakages should increase with the tonnage, but the facts show that this is not the case. The majority of failed rails for 75, 80 and 90-lb. rail have failed before 300,000,000 tons have passed over them, and between 300,000,000 and 2,500,000,000 the rate of breakage has decreased. This would seem to indicate that the new rails are defective. With the same tonnage in either case the rate of failure of the 90-lb. rail is much higher than the rate of failure of the 80-lb. rail, and the rate of failure of the 80-lb. rail is higher than the rate of failure of the 75-lb. rail, which seems to show that the 75-lb. rail is standing up better under traffic than the 80, and much better than the 90.

YOUNG ROTARY VALVE AND GEAR FOR LOCOMOTIVES

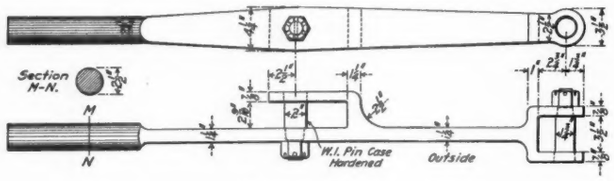
The Young valve and gear have been in use on a heavy passenger engine on the Chicago & North-Western Railway for five years, and most of the original motion pins are still in use and the service of the engine generally has been so satisfactory that the company has ordered the device to be applied to 10 new passenger engines now under construction at the Schenectady locomotive works of the American Locomotive Company. The application of the Young valve and gear to this locomotive was illustrated in detail in *The Railway Age*, November 4, 1904, and in the *Railroad Gazette*, November 4, 1904. Mr. Young has made an important improvement in the valve gear by the introduction of the Walschaerts type, and from a mechanical standpoint he has been able to work out a design of gear adapted to the Corliss valve which is even more satisfactory than the Stephenson link. The Walschaerts gear, especially adapted to this purpose, was first used on the Delaware, Lackawanna & Western, and the drawings illustrating that are here reproduced. It will be noted that in the modified Walschaerts construction there is provided a fixed center for the main pin in the combination lever. A rocker is placed on top of the steam chest, and this is operated from the cross head movement with a reach rod from the top of the combination lever. This is a constant motion and its function is to oscillate the central bearing of the wrist plate, it also moves the valves the amount of their lap and lead from their central position. Owing to the oscillating movement thus produced, the wrist place occupies its lower position in mid stroke of the piston, thereby spreading the valves or increasing their inside clearance at that portion of the stroke. There is thus obtained an exceptionally wide port opening for the exhaust at the time the piston speed is greatest, but there is still retained the comparatively early release of the Stephenson or usual type of Walschaerts gear which is



Plan and Elevation; Young Rotary Valve Gear.

so essential to high speed. In addition to this there is secured by this improved valve motion a delayed closure for compression, and this is accomplished without excessive inside clearance for full gear movement. The top of the wrist plate takes its motion from the link, and its movement varies with the different cut-offs.

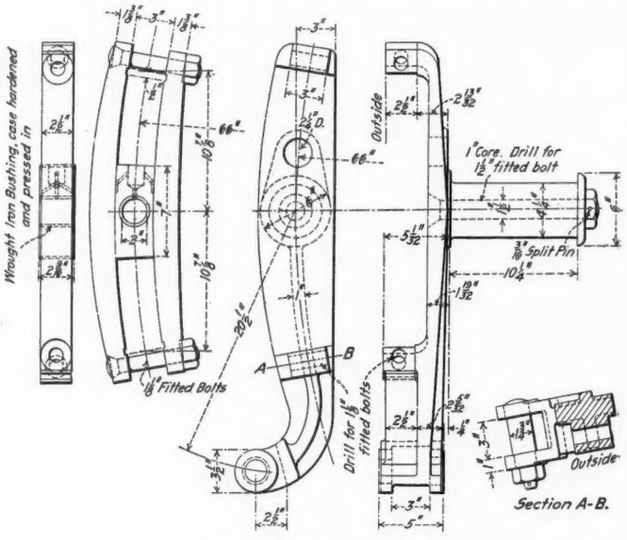
On the D., L. & W. engine which has 28-in. stroke, the maximum cut-off is 26 in. and this insures unusually prompt response to the throttle and therefore great starting power. The lead is $\frac{3}{16}$-in. constant and the pre-admission in all cut-offs practically zero. In a 7-in. cut-off the maximum port opening is ¼ in. on double ports, which for a single port engine would be equivalent to 32 in. in length. The release takes place at 20 in. and compression begins at 24 in. The D., L. & W. engine has been in constant service for a number of months and is a favorite with the enginemen, and the running repairs have thus far been remarkably light. In a road test recently completed between



Radius Bar.

the engine with a Young gear and a similar engine with a Stephenson link and piston valve, the former showed about 8 per cent. saving in water, an increase in the tractive effort, and in every case proved its ability to haul a heavier train up ruling grades without slipping the drivers. It is also a much smoother working engine, and this was particularly noticeable in the way in which the reverse lever could be handled under all conditions and its freedom from vibration.

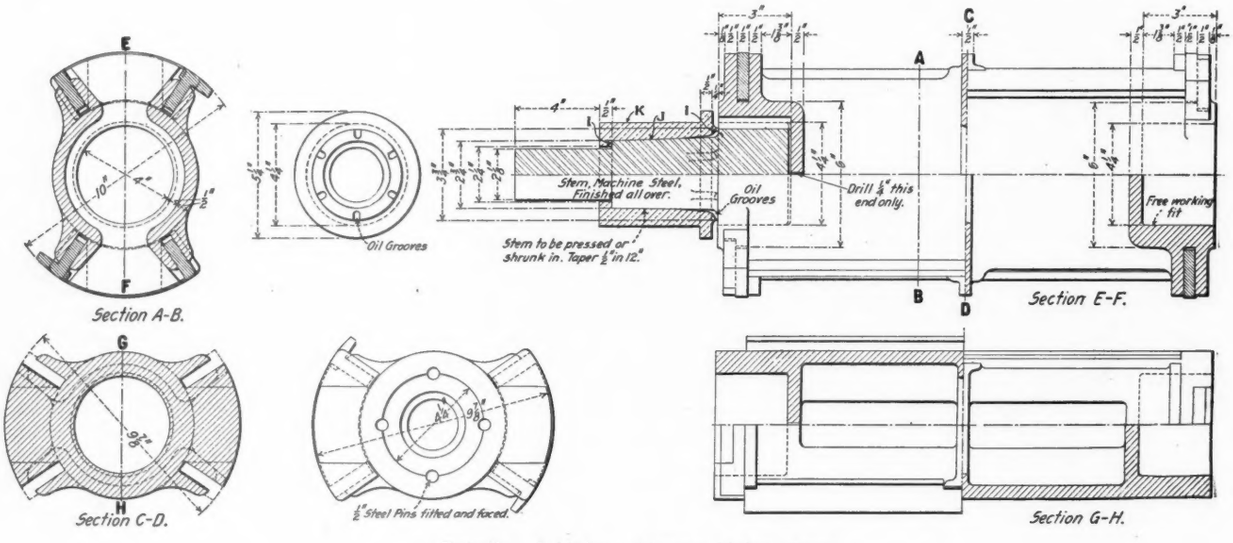
As the North-Western engines were designed especially for high speed and moderately heavy passenger trains on a comparatively level road, the valve events will be somewhat different from those given above for the D., L. & W. engine. For 26-in. stroke the maximum cut-off will be 23½ in., lead ¼ in. constant, inside clearance in full gear $\frac{1}{16}$ in. With 6-in. cut-off the clearance will be ¼ in., release will occur at 17 in. and there will be 4-in. compression. The cylinder clearance will be between 4 and 5 per cent. An unusual performance is expected from the North-Western engine in the way of high speed maintained for a long period, also some slight saving in the fuel consumption and a very large saving in the cost of maintenance of machinery. In the designs for the valve motion of the North-Western engine some innovations have been made in the way of improved mechanical construction and attention is especially called to the drawing showing the radius bar, the back end of which is turned instead of being rectangular. This turned end slips into a lifter which is provided with a universal joint which accommodates itself to any position of the radius bar which may be due to twisting strains or imperfect alinement. The effort has been to do away with any possible chance for binding in this joint which might cause vibration or stiffness in handling the reverse lever. The detail drawing also shows



New Form of Link.

an entirely new form of link. This is made with a single saddle and a projecting arm which engages the front end of the eccentric rod and is made integral with the saddle. The link proper is formed of two shoes which are bolted to the saddle in practically the same manner as the Stephenson link. This construction not only makes an exceptionally light link without sacrificing wearing surface, but is also cheaply manufactured and can be easily closed up to take lost motion.

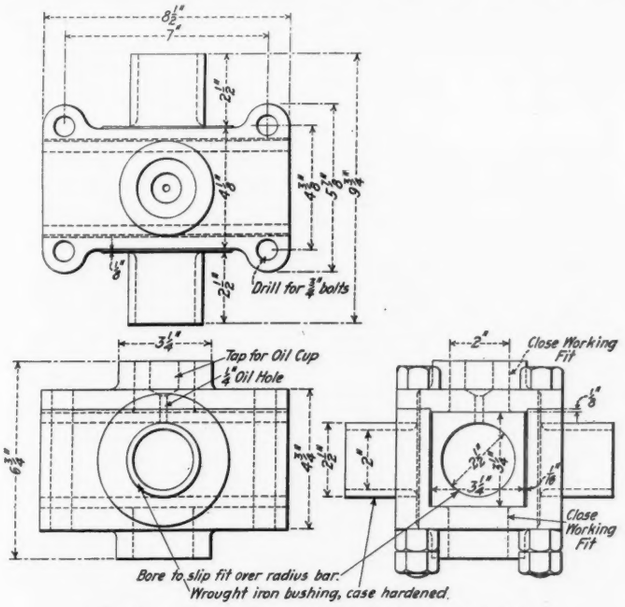
The modern locomotive with plain slide valve is an economical engine. Therefore whatever refinement can be accomplished in the way of improved steam distribution cannot



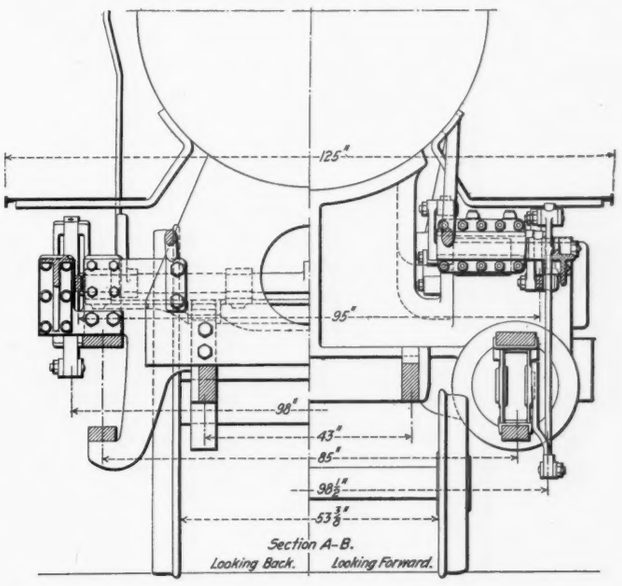
Details of Valve; Young Valve Gear.

produce radical economies in fuel saving. In Mr. Young's work in adapting the Corliss valve to locomotives and his improvements in the valve gear, he has endeavored chiefly to improve the engine's efficiency, especially in the matter of hauling heavier trains at high speeds. He has provided a valve which is easily actuated, one that will meet all conditions of service, that will be practically self-facing, that will cause no disturbance in drifting and that will not require excessive lubrication. The actuating mechanism is comparatively light and well designed. It has somewhat less movement than is usual in valve gears, and it has demonstrated that it produces a material saving in maintenance cost, not only of the valve and gear but of the entire machinery of the engine.

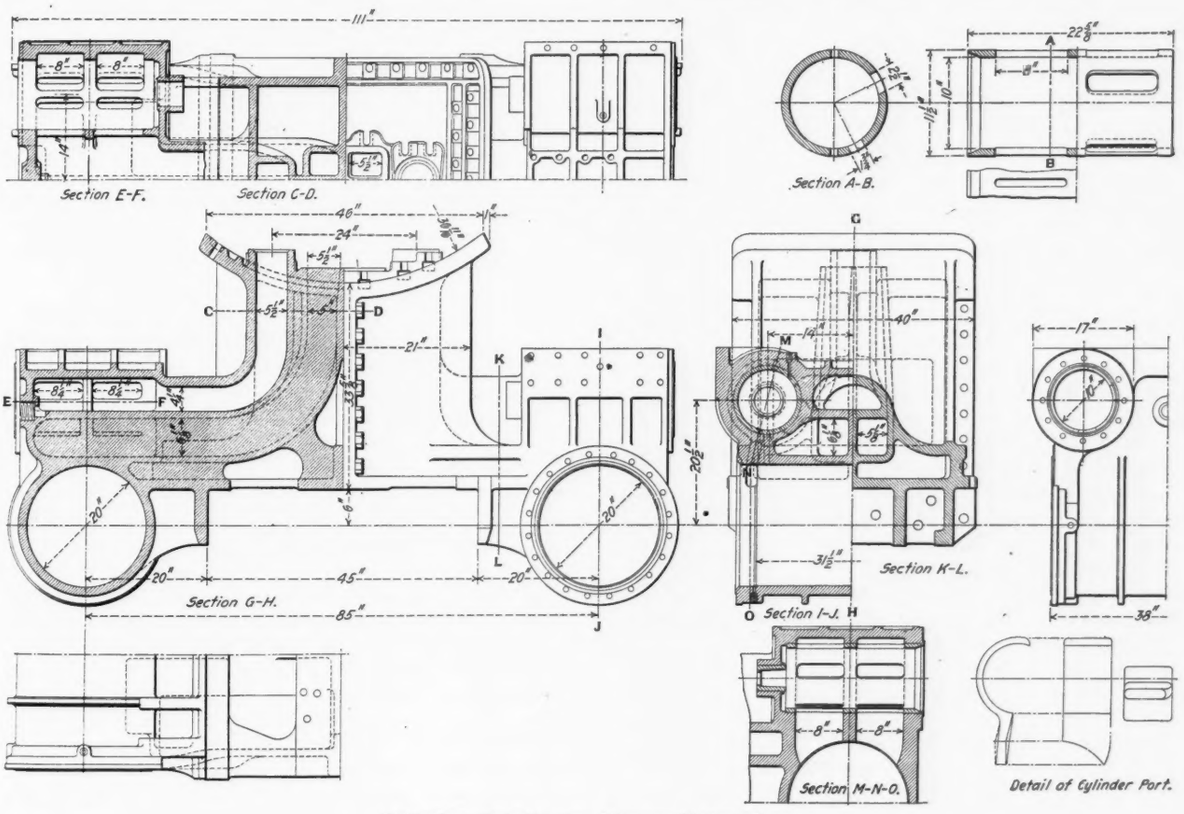
The American Locomotive Company has arranged its full size valve model at the Schenectady works to accommodate the new Young valve gear, and the various parts were adjusted for the valve gear proportions of the new North-Western locomotives. The model shows that in full gear the valve movement is so rapid while uncovering the steam port that the entire opening of 28 sq. in. is obtained by the time the piston has moved ⅝ in., and the entire exhaust area of 28


Drill for ¾" bolts
Tap for Oil Cup
¼" Oil Hole
Close Working Fit
Close Working Fit
Bore to slip fit over radius bar.
Wrought iron bushing, case hardened.

Radius Bar Lifter With Universal Joint.



Front and Rear Sectional Elevations of Valve Gear.



Cylinder Details for Young Valve Gear.

sq. in. is opened before the piston has commenced to move. This is the case in all positions of the reverse lever. For a 25 per cent. cut-off there is 24 sq. in. of area for exhaust when the piston is in mid-stroke. This is more than twice as much as it is possible to get with the Stephenson or Walschaerts valve gear, and with express engines it results in a very free exhaust and low back pressure, which should assist materially in obtaining high speed.

THE ELECTRIFICATION OF THE ST. CLAIR TUNNEL.

The Grand Trunk Railway has announced the completion and regular operation of the St. Clair tunnel between Port Huron, Mich., and Sarnia, Ont., and the event was celebrated by an inspection of the work by a large party of engineers and railroad officers on November 12.

A preliminary account of the electrification, illustrated by a map and profile of the zone operated by the St. Clair Tunnel Company, appeared in *The Railway Age*, January 19, 1906, and in the *Railroad Gazette* of the same date. An account of the electrical operation of the tunnel since May, 1908, was printed in the *Railroad Age Gazette* last week, but the accompanying description amplifies this, and includes operating details not previously covered:

The electrification of the St. Clair tunnel has been under consideration by the Grand Trunk Railway for some years, and plans for its accomplishment have been submitted from time to time. During the analysis of these plans a conference was held between C. M. Hays, Second Vice-President; E. H. Fitzhugh, Third Vice-President, and Bion J. Arnold, which conference resulted in the work being referred by Mr. Fitzhugh to Mr. Arnold for a report. This report, covering the general question of electrification, was submitted. It contained detailed estimates of cost of installation and operation of the various systems that might be used in connection with the work. The report was accepted by Mr. Fitzhugh, and Mr. Arnold was commissioned to prepare specifications for the equipment. The specifications stipulated, in addition to various guarantees regarding efficiencies of different parts of the system, and of the system, as a whole, that the installation when completed should be capable of hauling a 1,000-ton train through the tunnel, from terminal to terminal, in 15 minutes, and that in so doing the maximum speed should not exceed 25 miles per hour, and the minimum speed, when ascending a 2 per cent. grade, should not be less than 10 miles an hour. Tenders were submitted by the companies, that were prepared to undertake the work as specified, and after careful analysis the decision was made to adopt the single-phase alternating current system, using an overhead working conductor, this being the first decision providing for the application of the single-phase system to heavy steam road service. The contract was awarded some months later to the Westinghouse Electric & Manufacturing Company, and provided that it be responsible for the installation and successful operation of the entire equipment. The equipment has been in continuous operation since May 17, 1908, handling the entire train service of the St. Clair Tunnel Company, this service being the heaviest railroad service handled by electricity in the world.

THE TUNNEL.

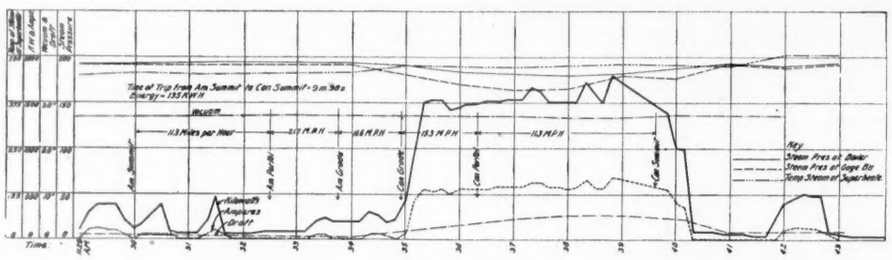
The St. Clair tunnel was opened for traffic in 1890 by the St. Clair Tunnel Company, organized as a subsidiary company to the Grand Trunk Railway system. The tunnel, located under the St. Clair river, is the connecting link between the terminal of the Western division at Port Huron, Mich., and the terminal of the Eastern division at Sarnia, Ontario. The length of the tunnel from portal to portal is 6,032 ft. The open tunnel approaches are of considerable magnitude, that on the Port Huron side being slightly over 2,500 ft. long, while that on the Sarnia side is nearly 3,300 ft. long, the total distance between the American and the Canadian summits being 12,000 ft., or about 2¼ miles. The grade on the tunnel approaches and the inclined sections of the tunnel is 2 per cent., while the flat middle section of the tunnel, about 1,700 ft. long, has a grade of 0.1 per cent. downward toward the east, just enough to provide for the proper drainage of any seepage water.

A single track extends through the tunnel, while a double

Locomotive in Tunnel.

track is laid in both of the tunnel approaches. The necessary tracks for handling the freight and passenger traffic are provided in the yards at Port Huron and Sarnia. The tunnel shell consists of cast-iron rings built up in sections, the inside diameter being about 19 ft.

The disposal of the rainfall on the tunnel approaches required particular attention. The areas of the Port Huron and Sarnia approaches are approximately 11 and 13 acres, respectively. Water precipitated on these areas during a rainfall is discharged into waste ditches on the bank above by means of pumps of large capacity. Retaining levees have been constructed, so arranged as to impound a large proportion of the water falling on the approaches. By this method the pumps have to handle only the water falling on the central portion of the approach during the rainstorm. Later the impounded water is discharged into the pump sump by valves provided for the purpose.



Log of the Power Plant; St. Clair Electrification.

As is evident, this pumping service is of great importance in the operation of the tunnel, as, should the tunnel become flooded with water, entire interruption of the traffic would

ensue. For the operation of the steam drainage pumps boiler plants were provided at each portal, and attendants were constantly on duty, it being necessary to keep up steam during a large part of the year in order to take care at a moment's notice of any rainfall that might occur.

Four steam locomotives of special design had been in commission since the construction of the tunnel for handling the freight and passenger traffic. They were designed to provide the necessary high tractive effort required to operate the trains over the grades in the tunnel and on the approaches, and arranged to burn anthracite coal, in order to minimize the inconvenience due to excessive smoke in the tunnel. These locomotives have given good account of themselves, and have handled the traffic in a satisfactory way throughout their service. Their maximum tractive effort limited the weight of the trains handled to about 760 tons, and even with this load the speed up the 2 per cent. grade was often very slow. With the constantly increasing traffic, at times the capacity of the tunnel with its steam equipment was taxed in handling the tonnage delivered to the tunnel company by the adjacent divisions of the Grand Trunk Railway system, and it was thought desirable to make such changes in the operation of the tunnel as would increase its possible capacity for handling traffic, and at the same time obviate the danger and inconvenience due to the presence of the locomotive gases in the tunnel.

The advantage of the use of electric locomotives, on account of the freedom from smoke and the attendant discomfort, together with the possible greater economy in operation, led finally to the decision to provide an electrical equipment to handle the tunnel service, this equipment to provide for the operation of the trains through the tunnel by means of electric locomotives; the handling of the drainage and seepage water by means of electric pumps; the lighting of the passenger stations, the tunnel and the roundhouses by electricity, as well as furnishing a certain amount of power to the roundhouses; also, provision was made for a limited amount of outside lighting in the form of arc lamps. The different electrical systems available for such service were considered, and estimates as to the relative cost and efficiency of the various systems were prepared and submitted to the tunnel company. These estimates covered the direct current system both with and without battery, as well as estimates on the alternating current systems. Complete specifications were prepared, covering both the direct and alternating current systems, and propositions on these received and considered. Decision was finally made in favor of alternating current, using a 3-phase system for the distribution of power required for pumping and for shop motors with single-phase distribution for locomotives and lighting.

SERVICE CONDITIONS AND REQUIREMENTS.

The St. Clair Tunnel Company is operated as an independent division of the railroad, the trains being delivered by the Western division in the yards at Port Huron, and taken by the tunnel locomotives through the tunnel and delivered to the Eastern division at the yards in Sarnia, the westbound trains being handled in the reverse order. The steam locomotives operating on the division adjacent to the tunnel are never operated through the tunnel.

In order to increase the capacity of the tunnel it was desirable to provide for the maximum practicable tractive effort in the new locomotives.

The capacity limit was determined by the maximum pull to which it was deemed wise to subject the drawbars on the mixed rolling stock that must be handled without danger of breaking trains in two. For this reason the locomotives were specified of sufficient capacity to develop a drawbar pull of 50,000 lbs., when operating at a speed of 10 miles per hour. It was estimated that such a locomotive would be able to make the complete trip through the tunnel from terminal to terminal with a 1,000-ton train in fifteen minutes, or four 1,000-ton trains per hour, which would provide a capacity for traffic about three times larger than the actual maximum demands up to the present time.

It was estimated that the pumping service, for which adequate provision must be made, would require the installation at the Sarnia portal of two pumps each of capacity of 5,500 gallons per minute, and at the Port Huron portal the installation of two pumps, each with a capacity of 4,000 gallons per minute. To provide absolute continuity of service, duplicate pumping equipments were provided in each portal, as well as duplicate feeder lines leading from the power plant to the pump houses.

The lighting service to be provided for is of minor impor-

Pair of Locomotives at Entrance of St. Clair Tunnel.

tance, in so far as the amount of power required at both Sarnia and Port Huron is concerned, this being somewhat less than 100 kw. The power requirement for motors in the roundhouses at Port Huron and Sarnia is about 100 kw. for both shops.

To furnish electrical energy for the service outlined above provision must be made in the power plant for supplying single-phase current for the electrical locomotives, 3-phase current for the pumping service and 3-phase and single-phase current both for the power and lighting service at various points throughout Port Huron and Sarnia, as well as for a small amount of arc lighting.

ELECTRIFICATION EQUIPMENT.

Three locomotives have been provided for this service, each consisting of two half-units, each half-unit mounted on three pairs of axles driven through gears by three single-phase motors with a nominal rating of 250 h.p. each, the nominal horse power of the complete locomotive unit being 1,500. In so far as the electric motors have a very liberal overload rating, it is easily possible to develop 2,000 h.p., and on occasion in excess of this in one locomotive. The half-units are duplicate in every respect, and as the multiple unit system of control is used, they can be operated when coupled together with the same facility that a single-phase half-unit can be operated.

As previously stated, the locomotives are designed to develop a drawbar pull of 50,000 lbs. at the comparatively low speed of ten miles per hour. The locomotives are powerful enough to start a 1,000-ton train on a 2 per cent. grade in case this should be necessary. At a test made on a half-unit, using a dynometer car, it was found that a single half-unit developed 43,000 lbs. drawbar pull before slipping the wheels. This was done on a comparatively dry rail, with a liberal use of sand. On this basis it would be possible to develop about 86,000 lbs. drawbar pull with a complete locomotive. The maximum speed of the locomotive is 35 miles per hour. However, it is not the intention of the tunnel company to operate the locomotives at a speed in excess of about 30 miles per hour.

The locomotive cab is rectangular in section, constructed of sheet metal supported by structural steel shapes. Inside of the cab are located practically all of the apparatus used in connection with the locomotive, with the exception of the motors and the brake rigging. Included in this apparatus is a single-phase transformer used for reducing the voltage from 3,300 to a voltage suitable for application to the motor. The transformer, as well as the motors, are air-cooled, the supply of air being furnished by an electrically driven blower, also located in the locomotive cab. The blower is driven by a single-phase motor, the current being supplied at 100 volts by a tap from the main transformer. With the moderate supply of cooling air furnished by the blower fan, both transformers and motors are able to operate at full capacity with comparatively little increase in temperature above that of the surrounding air. The air for the cooling is taken through a suitably designed shutter located in the side of the locomotive cab, and is distributed through sheet metal ducts installed under the cab floor to the three motors under the cab and to the transformer. From the latter the air passes either through an opening in the floor of the cab into the open air, or, if desired, into the interior of the cab. In the latter case an appreciable amount of heat can be secured from the main transformer for utilization in heating the cab during cold weather.

Electric Locomotive for St. Clair Tunnel.

Motor-driven air compressors are also located in the cab. The air brake equipment is of the standard type used for electric cars and locomotives, with the exception of the motors, which are single-phase. They are operated by means of an electric controller, which serves to keep the normal air pressure at about 100 lbs. The compressed air is used for the purpose of operating both the automatic and straight-air equipment on locomotive and train, and in addition for a variety of minor purposes in and about the locomotive. All of the contactor switches used in controlling the operation of the locomotives are air operated, the air valves being oper-

ated by direct current electrical control. This is also true of ringing the bell, blowing the whistle, raising and lowering the trolley and the application of sand to the tracks.

Speed control of the locomotive is effected by varying the voltage at the terminals of the motors. This is obtained by making connections with various transformer taps by means of the air operated, electrically controlled contactor switches. Electric control of the contactors is effected through the master controller, which in the electric locomotive replaces the throttle valve in the steam locomotive. The current for the master controller is furnished by a small storage battery operating at about 20 volts, the battery in turn being charged by means of a small motor-generator set provided for the purpose. The electric controller has 21 points in all, 17 of which are running points. This provides for an increase in the speed of the locomotive from the lowest running speed to the maximum speed by very slight gradations, thus making it possible to maintain a practically constant drawbar pull, while the locomotive is accelerating the train. This is very desirable, in so far as the minimum variation in the drawbar pull while handling the train through the tunnel decreases the liability of breaking the train in two. Particular attention was given this phase of the train operation in designing the locomotive, and the resulting remarkable decrease in the number of breaks-in-two since the operation with electric locomotives has been inaugurated is a source of great satisfaction.

The current is collected from the trolley wires suspended at a distance of 22 feet from the track by means of a sliding bow pantograph trolley. In so far as the trolley wire extends throughout the length of the tunnel, no additional provision has to be made for the collection of current while the locomotive is passing through the tunnel. Electric headlights are provided, as well as lights for the illumination of the interior of the cab and the dials of the indicating instruments. The heating of the cabs is provided for by means of standard electric heaters. Heat is also available for drying the sand stored in sand boxes. In general, the M. C. B. standards have been conformed with in so far as couplers, wheel treads, etc., are concerned. The general dimensions of the half-units are as follows:

Length over all	23 ft. 6 in.
Height from top of rail to top of roof	13 ft.
Height from top of rail to top of pantograph bow when lowered	14 ft. 11 in.
Width of cab over all	9 " 8 "
Total weight locomotive half-unit, fully equipped	67½ tons
Weight of complete locomotive unit	135 tns
Length of rigid wheel base	16 ft.
Diameter of driving wheels	62 in.
Normal speed of train on 2 per ct. grade, per hr.	10 miles
Normal speed on level tracks, per hour	25 to 30 miles

In service it has been found that the locomotives will very readily handle a 1,000-ton train at from 11 to 12, and possibly 13 to 14 miles per hour on a 2 per cent. grade, thus demonstrating their ability to more than fulfill the specified performance.

PUMPING.

The second service to be provided for electrically consists of the pumping necessary to free the tunnel approaches from water due to rain storms or melting snow, and the removal of a small amount of condensation and seepage water collecting in the tunnel. For this purpose pumping plants have been installed at both tunnel portals, that at the Port Huron entrance consisting of two centrifugal pumps, each capable of delivering 4,000 gallons per minute, driven by direct connected, 100 h.p, 3 phase, 25-cycle, 3,300-volt induction motors, and that at the Sarnia entrance consisting of two 55-gal. pumps, driven by two 200 h.p. motors of the same type.

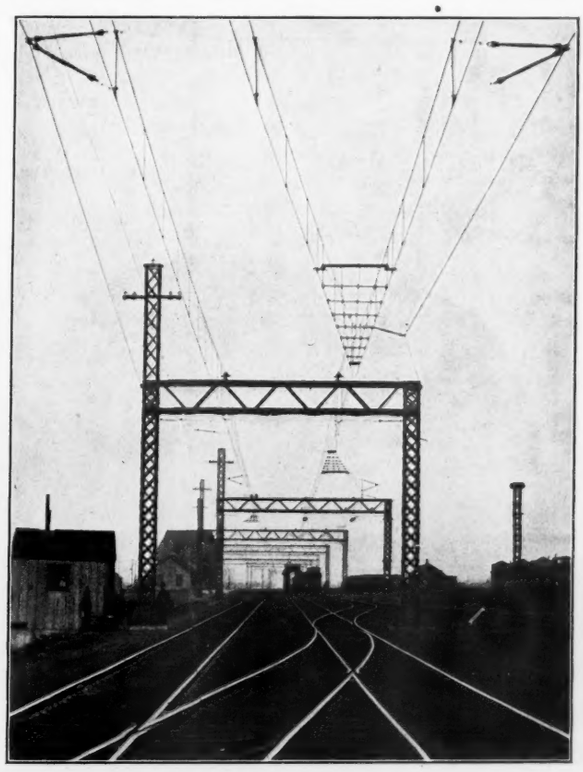
The centrifugal pumps used in this service can be primed by means of the water stored in the large discharge pipes. Valves controlling the flow of the water are all located so as to be conveniently accessible for the pump house operator. The equipment has been found to operate in an entirely satisfactory manner, and provides for the handling of water with a minimum amount of attendance and expense.

Two 150-gallon, motor-operated, centrifugal pumps are located at the foot of the Sarnia grade, and serve to remove from the tunnel the condensation and seepage water, delivering it to the well at the Sarnia portal. The seepage pumps are similar to the small pumps installed at the portal pump houses, with the exception of motors, which for this service are entirely enclosed, suitable for continuous operation in the tunnel, where they are liable to be subjected to more moisture than are the motors located in the pump houses.

LIGHTING AND POWER.

Incandescent lamps in the roundhouses, the passenger stations, the Young Men's Christian Association buildings in both Port Huron and Sarnia, installed previous to the electrification of the tunnel, are now being furnished with current from the electric power plant by means of step-down transformers, reducing the voltage from 3,300 to 110 volts.

Motors operating at 3,300 volts have been installed in the roundhouses at Sarnia and Port Huron, the current supply being taken from the power plant. In all, 480 lights have been installed throughout the tunnel on either side at a height of 10 feet above the rail. The tunnel lamps are operated four in series from the 440-volt secondaries of the lighting transformers installed in the tunnel. Similar transformers furnish the current supply for the tunnel drainage pump motors. In addition about 30 arc lights have been provided and installed in the yards at either terminal. These are used for general illumination around passenger stations, roundhouses, and coal chutes. The current for the arc lights is furnished at the power plant by means of a mercury arc rectifier. The total amount of lighting is somewhat under 100 kw., which, together with the motor requirements of 100 kw., makes a total of slightly over 200 kw. for small power and lighting outside of the plant.



Overhead Construction; St. Clair Tunnel Electrification.

ELECTRICAL DISTRIBUTION SYSTEM.

For distribution of the single phase current to the locomotive, substantial steel towers have been erected throughout the tunnel yards. The steel work used for supporting the working conductor consists of strong lattice columns supporting bridges

of trussed construction. The average spacing of the overhead bridges is 250 ft. They are designed to extend over all tracks that are to be electrified, and in case of those located at passenger station extend, in addition, over the platforms, thus in no way interfering with the access of passengers to and from the trains. This necessitates a length of about 141 ft., in case of some of the bridges located on the Port Huron side, in which case the bridge spans seven electrified tracks, in addition to the station platform.

Single catenary construction is used throughout, a messenger cable of 5/8-inch extra heavy galvanized steel being suspended on the insulators located on the overhead bridges immediately over the center lines of the track to be equipped. The working conductor is attached to the messenger cable by means of fittings of varying lengths so arranged as to support it at a uniform height of 22 ft. above the top of the rail. Number 4/0 hard-drawn grooved copper is used throughout the yards, and at all places, excepting on the tunnel approaches and throughout the tunnel, on which sections two 300,000 cm. conductors have been installed. The messenger cables forming the catenary construction terminate at the tunnel portals, where they are securely anchored to eye bolts imbedded in the heavy masonry portal. At this point the messenger wires supporting the working conductor throughout the tunnel are anchored to special brackets located on the tunnel face. The working conductors in the tunnel are continuous with those on the tunnel approaches.

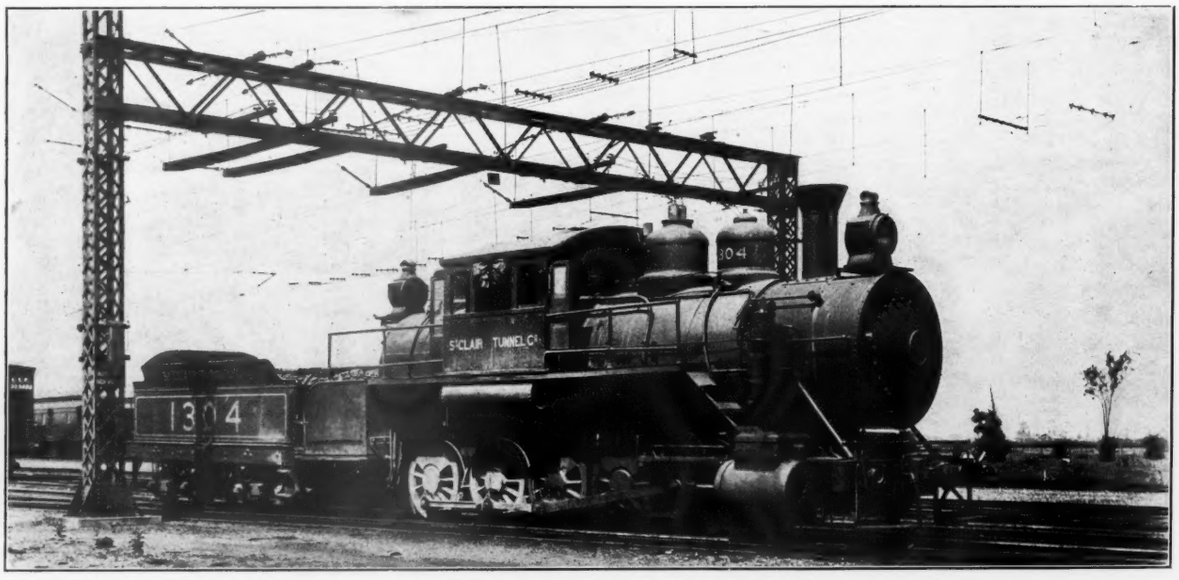
The method of supporting the trolley inside of the tunnel shell was conditioned by the requirement that complete overhead equipment should not encroach on the tunnel opening more than 9 in. This has been accomplished by bolting to the tunnel shell special iron brackets, each of which supports two spool-shaped insulators. These insulators in turn support steel messenger cables, which are drawn taut throughout the length of the tunnel, and attached at the tunnel portal to special brackets. Special clamps are attached to these messenger cables at points between the insulator supports, and these in turn serve to support the two trolley wires. The insulating supports are attached to the tunnel shell at intervals of 12 ft., as also are the clamps connecting the messenger cable with the trolley. This method provides an attachment at once sufficiently rigid to maintain the proper clearance between the trolley and the tunnel shell, and at the same time sufficiently flexible to provide for the proper operation of the trolley bow on the overhead conductor. Section switches have been provided where necessary to permit of disconnecting the working conductor over any switch track from the main line extending throughout the tunnel.

All feeder lines connecting the various parts of the equipment to be supplied from the power plant are carried in the tunnel conduits. For this purpose four conduit lines have been laid on either side of the tunnel throughout its length. Connection has been made with these conduit lines at a point about 1,700 ft. from the Port Huron portal, with a vertical shaft extending from the top of the tunnel to the surface of the ground, terminating at a point about 75 ft. from the power plant. The overhead feeders, terminating as above noted in the portal pump houses, are continued as underground feeders down through the tunnel and up the shaft, finally terminating in the switchboard at the power plant. For the pumping service, two independent feeders are laid from each portal pump house, one being installed on either side of the tunnel and both terminating at the power plant switchboard. The heavy feeders for supplying the locomotive current to the trolley extend from the tunnel through the vertical shaft to the power house. This arrangement provides for all feeders leaving the power plant underground. The cables are paper insulated, lead encased and are installed in tile ducts.

POWER PLANT.

The power plant is located on the Port Huron bank of the St. Clair river, about 100 ft. distant from the center line of the tunnel. The building is 50 ft. from the street property line, which provides ample space for a lawn in front, while the back building line is about 50 ft. distant from the retaining wall, which serves as a dock line along the river. Sufficient space is afforded between the building and the river front for side-track, a spur of the Grand Trunk Railway, which is used for bringing in coal and various supplies needed for the operation of the power plant, as well as the removal of ashes. The proximity of the river makes it possible for coal to be received and handled by boat in case this should be found desirable. The power plant building covers a ground area approximately 100 ft. sq. The building is divided longitudinally by a fire wall, separating the boiler from the turbine rooms. The foundation up to the water table is constructed of mass concrete; the building superstructure is of steel and massive paving brick of dark brown color. The building trimmings are of cut stone and concrete. The general design of the building is along simple lines and presents upon completion a very attractive appearance.

The self-supporting steel structure is carried on concrete foundation walls and footings. The steel work carries not



Steam Locomotive Formerly Used in St. Clair Tunnel.

only the reinforced cinder concrete roof, but in the turbine room the runway for the traveling crane, and in the boiler room the reinforced concrete coal bunkers. The brick building walls are also carried on the concrete foundations, and are built about the steel columns. The walls are finished at the top with a parapet capped with concrete coping. The wood work used in finishing the interior of the offices and turbine room is of mission oak.

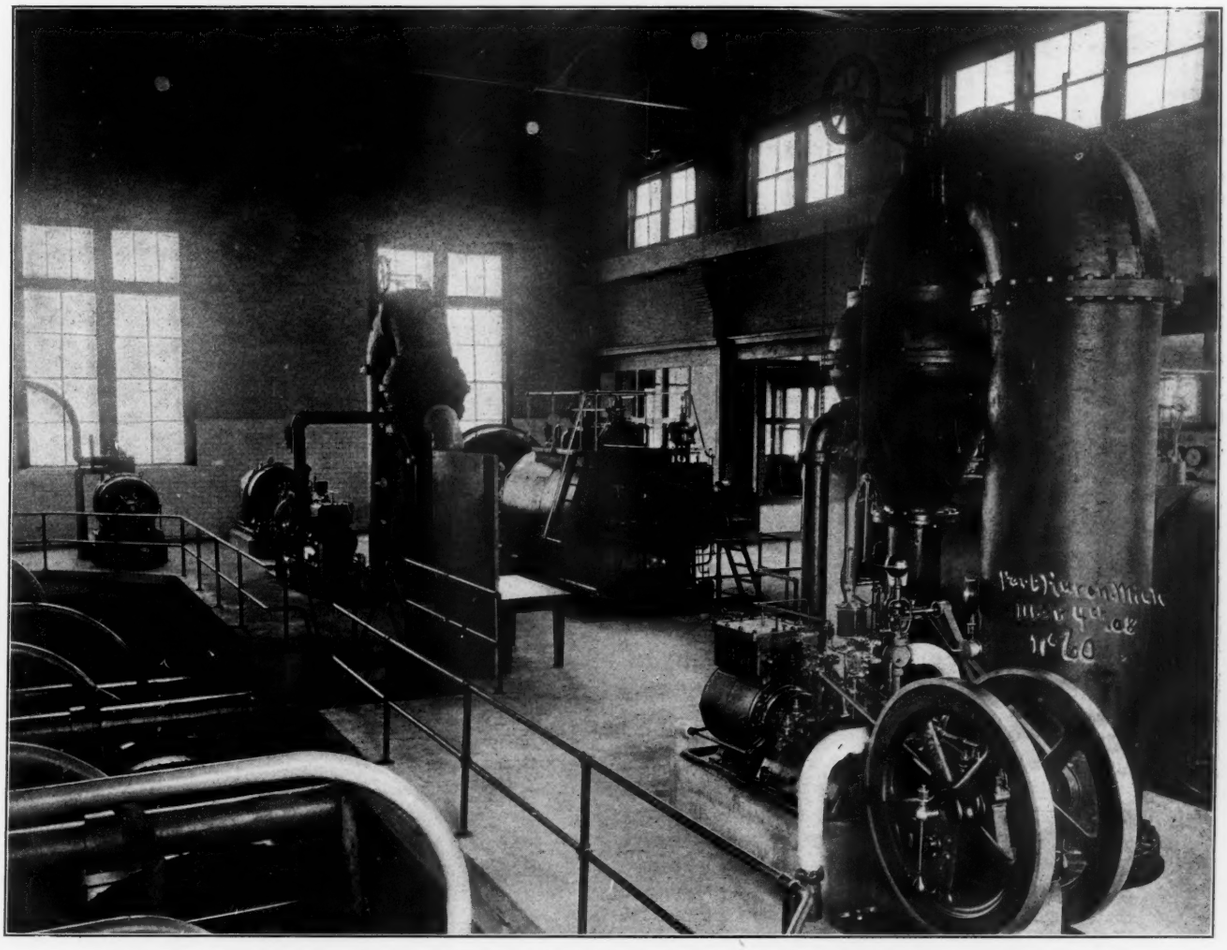
Two Westinghouse Parsons turbo-generators have been installed in the plant. The machines are designed to operate at a normal voltage of 3,300 volts, with a frequency of 25 cycles per second. They are 3-phase machines, but are further required by the specifications to furnish their full rated load of 1,250 kw. single phase current. The turbines are approximately 37 ft. over all, 6 ft. in width, and 8 ft. high, and designed to operate at 1,500 r. p. m. The generators are cooled by means of air drawn through the coils by vanes installed on the rotor. A speed limit device is arranged to cut off the supply of steam in case the speed of the turbine exceeds a predetermined value.

Barometric jet condensers with 30-in. inlet manufactured by the H. L. Worthington Company have been installed in connection with each of the steam turbines. A 36-in. exhaust pipe connects the exhaust outlet of the turbine with reducing fitting attached to the condenser head. A 14-in. automatic relief valve is installed in connection with the exhaust fitting, and connected to the free exhaust piping, the cooling water for each condenser is furnished by a 10-in. volute pump driven by 7x9 vertical engine. The rotative straight line vacuum pumps, 8x6x12 in dimension, are supplied in connection with each condensing equipment. The dry vacuum pumps are located on the turbine room floor alongside the condensers, while the circulating pumps are located in the open pit in the turbine room basement, where they are in plain view from the turbine room floor.

Two steam-driven exciters have been installed in the plant, each of 25 kw. capacity, this being sufficient to provide excitation for a single turbine. In addition a motor-driven exciter of 40 kw. capacity is installed, and is ordinarily used in the operation of the plant, the two steam-driven exciters being for additional security so far as continuity of service is concerned. The generators of the steam-driven exciters are driven by vertical type engines and motor generators and engines and all of Westinghouse manufacture, the motor being 3-phase, 3,300-volt, of the squirrel cage induction type.

The switchboard, also of Westinghouse make, contains ten panels.

A hand-power traveling crane of 15 tons capacity, manufactured by the Northern Engineering Works, is installed on runways in the turbine room, by means of which all parts of the equipment in the room can be conveniently handled.



Interior of Power Station; St. Clair Tunnel Electrification.

CONSTRUCTION AND OPERATION OF THE ELECTRIFIED SYSTEM.

The entire electrical equipment has been in preliminary operation during the larger part of the year 1908. The work of construction was done without any material interference with the traffic through the tunnel. The greatest difficulty was experienced in carrying out that part of the installation located in the tunnel proper. For this purpose the tunnel was given over to the contractor for construction purposes for two 2-hour periods each day during the time that actual construction was in progress in the tunnel.

The problem of transferring the operation of the St. Clair Tunnel division of the Grand Trunk Railway system from steam to electricity gave rise to another problem which was

successfully solved by the mutual co-operation of the representatives of the tunnel company and the contractor. No attempt was made to make a sudden transfer, but every precaution was taken not only to thoroughly test out all electrical equipment before attempting to use it in regular service, but also to allow ample time in which to thoroughly familiarize all those connected with the operation of the equipment with their work. Steam locomotive engineers were trained in the use of the electric locomotives. The force required for maintenance of the locomotives and for maintenance and operation of the power plant were secured and assigned their duties during the time that the first experimental and test runs were made with the equipment. When everything was in readiness, test runs were made with light locomotives through the tunnel, and later moderate-sized trains were taken through the tunnel as test loads, and finally a limited number of regular trains were handled by the electric locomotives. In this way, by gradually increasing the amount of work done by the electrical equipment, the entire operation was transferred from steam to electricity. The fact that no delays worthy of notice have occurred, either during the time of partial operation, or later, during the time of preliminary electric operation, is worthy of special note, indicating as it does not only the high character of the system so far as design and construction is concerned, but as well the conformity to the operating conditions that must necessarily be made in changing the operation of a division of a railroad system from steam to electricity.

Some of the salient features in the operation of the plant may be seen by reference to a typical load curve. This curve is a graphical log of the operation of the plant during the time required for the passage of trains from one terminal to the other. It shows at a glance the power required by the locomotive, and the variation of boiler pressure, forced draft pressure, superheat, etc., during the cycle represented by train movements in the tunnel. The efficiency of all parts of the equipment is fully up to the contract requirements, and in fact in many cases the performance is found to exceed that guaranteed. From the results of preliminary operation it appears that the economies which will be effected by the electrification will be slightly in excess of the attainment estimated at the time the preliminary report on the proposition was submitted.

A NEW UNDERGROUND RAILROAD THROUGH BERLIN.

In the capital of Germany there are some 130 street car routes, besides an urban steam railroad and a combination elevated and underground system. This latter has existed since 1902 and has been constantly extended westward. One of the points where the track crosses the street level and goes into a subway is the Leipziger Platz. This is a very crowded square, and offered the best opportunity for a branch to the northern section of the city, which is chiefly a business district.

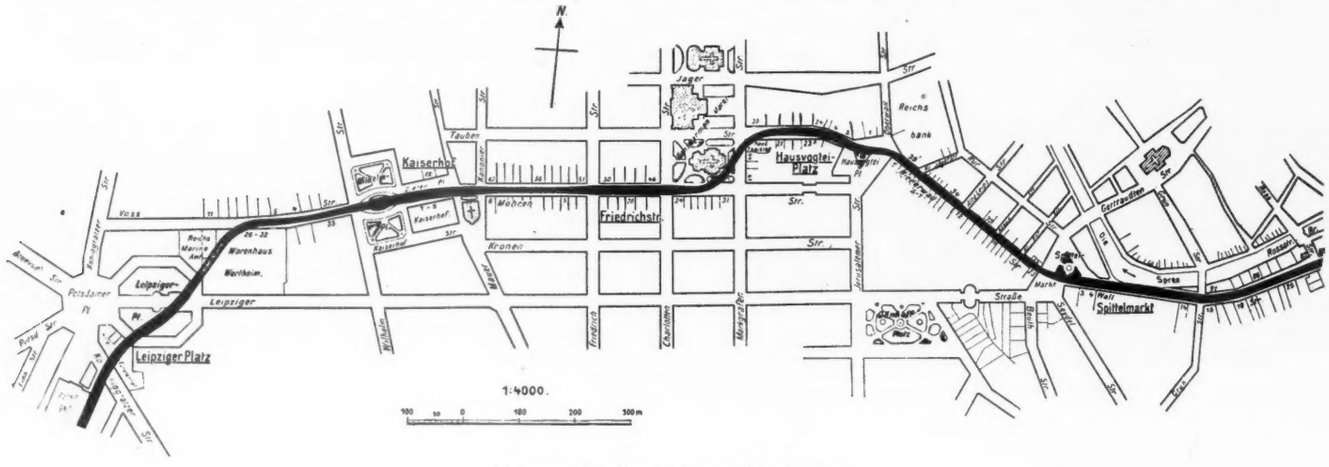
This branch was completed the first week of October, 1908, after two years of hard work, day and night. The difficulties were greater than with the subway in New York, and still greater than in London, as the ground is a kind of quicksand and excavations had to be made beneath several buildings where it was necessary to put in new pillars and to increase the foundations. Openings were made in the basement foundations and the tunnel laid through them in such a way that a clearance remained between it and any part of the structure standing over it.

Still greater difficulties were encountered with the present terminus at the east end, the Spittelmarkt. Here, as shown on the accompanying map, the tunnel runs along the River Spree.

Station Where New Branch Starts.

To keep water out of the excavations a row of sheet piles was driven into the river-bed and the space between these piles and the bank, one meter wide, was filled with waterproof clay. But the soil there is like a swamp, and another pile frame had to be rammed in to strengthen the foundation for the tunnel and to prevent the large business houses in the neighborhood from tumbling over or sinking in. Owing to the fact that one side of the tunnel borders the water, openings were made to let the daylight in and to furnish fresh air. These side windows give the station and tunnel a peculiar appearance.

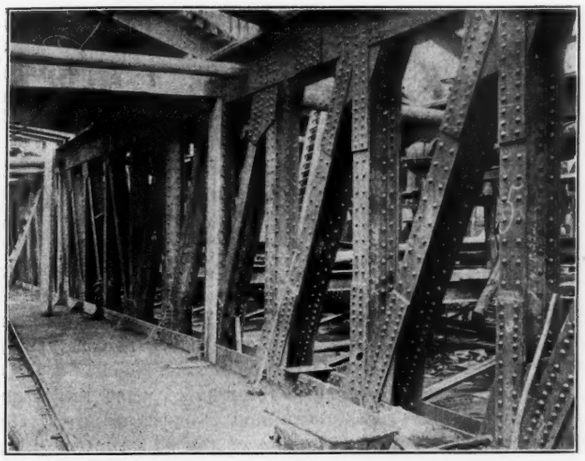
White tiles and marble are used for walls and ceiling within stations and the whole line is lighted by electric lamps. Only non-inflammable material has been used in the tunnel. The train crew is enabled to shut off the current from the third rail without leaving the cars, so that passengers can walk on



Map of Berlin Subway Extension.

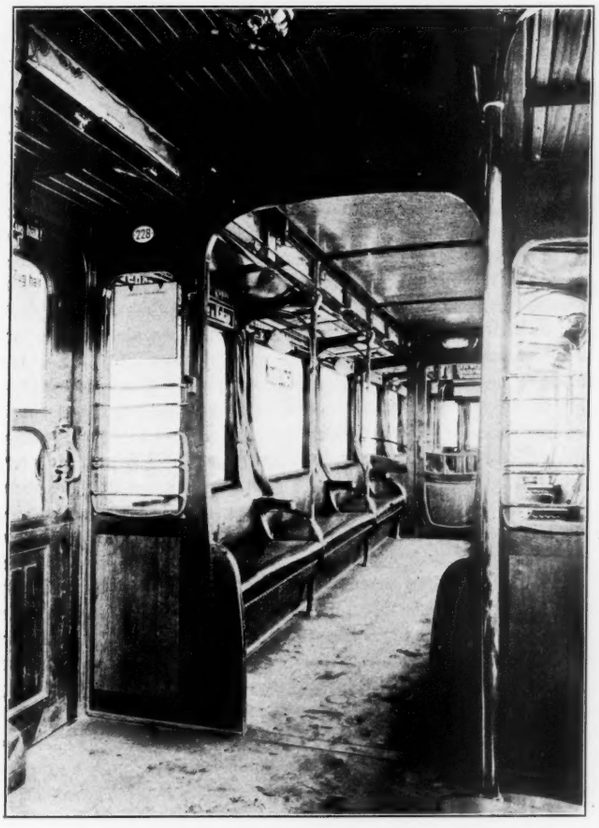
the track should a stoppage occur. The current for lighting the tunnel and the stations is independent from that used to propel the trains.

The general direction of the urban railroads in Berlin is east



Undermining a Department Store.

and west, and a connection to the north is very much needed. The new branch will fill the gap, for it proceeds first a little eastward to the Spittelmarkt, as seen on the sketch, and then directly north to the Metropolitan Railroad in the northern part of the city. The last stretch will be completed in 1915. The present first half of this important connection has four



Interior of Third Class Car; Berlin Subway.

stations and cuts through a densely populated business district. Owing to this fact and the many difficulties referred to, the expenses were rather high and this first stretch, 6,562 ft. long, has cost $5,000,000.

THE RAIL MILL OF THE INDIANA STEEL CO. AT GARY.

The prospect for obtaining an adequate supply of open hearth steel rails will be considerably improved by the operation of the large rail mill and open hearth furnaces of the Indiana Steel Company at Gary, Ind., which are now nearing completion. The magnitude of this enterprise has excited general interest, and some of the principal figures relating to the works, and a brief description of the rail mill machinery are given below.

The ore will be delivered in steamers having a capacity of 10,000 to 12,000 tons, and these are unloaded by machines operating clam shell buckets having a capacity of 5 tons; one of the larger buckets has a capacity of 10 tons. There are 16 blast furnaces, each having a capacity of 500 tons of pig iron per day. Of the gas produced by these furnaces, 30 per cent. will be used for heating the stoves for the hot blast, 7½ per cent. is for auxiliary boilers, 5 per cent. is used by other auxiliaries or lost in the process of cleaning, 12½ per cent. will be used for running the gas-engine-driven blowers and 45 per cent. for the engines in the electrical power station. In this station there are 17 double-acting gas engines coupled to electric generators. The engines have a rating of 4,000 h.p. and the generators 2,000 k.w each.

The molten iron from the blast furnaces is conveyed in 40-ton ladles and delivered to mixers having a capacity of 300 tons each, and from there it is carried to the open hearth furnaces. The plans provide for six batteries of basic open hearth furnaces, 14 in each battery, and two batteries, or 28 furnaces, are now built. With the four open hearth batteries completed, the Gary plant will have a capacity of over 12,000 tons of steel per day, or 2,500,000 tons per year. With all six batteries in use, the total capacity of the plant will be 4,000,000 tons of steel per year. The rail mill at Gary will be the largest in the world, the total capacity as planned being 4,000 tons of steel rails per day, or 100,000 tons per month. The ingots are 20 in. x 24 in., 6 ft. long and weigh 8,500 lbs. each. The aggregate capacity of the motors connected with the roll trains is 24,000 h.p. The group of rail mill buildings, located about 300 yds. from the lines of the open hearth furnaces, constitutes in itself an enormous plant. The main structure is 1,800 ft. long, and at right-angles to it is another building of one-third the length, with a width in a single span of 85 ft. This contains 12 soaking pits or furnaces, each of which is supplied with gas from an independent Hughes mechanical gas producer. The arrangement here is such that ingots enter from the open hearth furnace buildings along the entire length of one side of the pit building, the other side being reserved for the electrically operated ingot buggies which transfer the heated ingots through the first stand of rolls. Each of the 12 pits has four holes 6 ft. by 6 ft., and is provided with the usual equipment of hydraulic cylinder covers and reversing air and gas valves of the well-known Dyblie type. For the operation of the two ingot buggies used, the Cutler-Hammer Mfg. Co., Milwaukee, Wis., has developed an ingenious system of control. On account of the length of the building in which the soaking pits are located, it is impossible for the operator stationed at the mill to see when an ingot buggy is opposite a particular pit. It was, moreover, deemed necessary to guard against the possibility of the operator becoming confused and bringing both ingot buggies to the mill at the same time, which would result in a collision. The special controlling system provides guards against this contingency, at the same time enabling the operator to automatically stop the ingot buggy at any of the pits.

The rail mill is equipped with 12 sets or stands of roll trains, all operated at varying speeds by General Electric a.c. motors, some of which are of the largest sizes ever constructed for industrial service. These are housed in a separate bay, or lean-to, running parallel with the rolls. The rotors are 20 ft. in diameter and have a speed of 83 revolutions per minute. All of the motors are connected directly to the roll trains by

regular mill couplings. Although the motors are provided with fly-wheels and run in one direction, provision is made for reversing in case of necessity. The control system has been worked out with the greatest nicety, all operations being under the instant control of the operator by means of a master controller.

The first group of rolls consists of four stands of continuous 40-in. mills, each two of which are driven by a 2,000-h.p. motor. They are arranged in tandem, requiring no manipulation from stand to stand. Here, as elsewhere through the plant, sufficient distance is left between successive sets of rolls to enable a quarter turn of the ingot or bloom to be made, so that it is worked equally on all sides. The first two mills are at present equipped with 42-in. rolls, enabling 20-in. by 24-in. ingots to be used. After passing these four mills the ingot is sent to a 40-in. three-high blooming mill equipped with lifting tables and arranged with a combined hydraulic and pneumatic balancing device. This mill, which is driven by a 6,000-h.p. motor, gives the ingot five passes.

After being bloomed the ingot is sheared in a 10-in. by 10-in. horizontal blooming shear, and the crop ends or butts are taken outside of the mill by a butt conveyor of unusual construction, which was designed and built by the engineers of the Indiana Steel Company. Each bloom then goes through a 28-in. roughing mill, which is three-high and equipped with tilting tables. This mill has three stands or rolls. The roughing stand, however, is the only one that is three-high, the other two stands being two-high. The mill is driven by a 6,000-h.p. motor and gives the bloom three passes. After leaving the roughing mill the bloom goes through a two-high 28-in. forming mill driven by a 2,000-h.p. motor, receiving but one pass. Then it is sent to finishing mills, which consists of five stands of 28-in. mills driven by two 6,000-h.p. motors.

After the dummy pass, the bloom is transferred to the first edging, which is in this same mill but the second stand, and turns back on an elevated table to the second edging, which is in line with the 28-in. roughing mill. It then travels by chain transfer to the lower tables and on the leading pass goes through a stand, which is also in line with the roughing mill and driven by the same motor, and continues on to the third stand of the 28-in. finishing mill, this being the eighteenth and last pass. After the finishing pass the rail travels through to the saws, of which there are five provided, thus cutting four rails to length. These four rail lengths consist of half the ingot. As the capacity of this mill is 4,000 gross tons per 24 hours it will be seen that there must be a four rail length sawed about every half minute. The saws have 42-in. blades, arranged to be raised and lowered in unison by one controller from the hot saw operator.

After leaving the hot saw run, the rails pass over the usual cambering machine and are run onto hot beds 100 ft. long, of which four are at present installed, with provision for an additional two, if necessary. These hot beds extend to the south of the mill proper. In the finishing mill section they are of unusual design, being made of structural material and placed 8 ft. above the floor, allowing for an extraordinarily large air space to facilitate the rapid cooling of the rails. The finishing building is 1,383 ft. long, central with the hot beds, and provided with live rolls extending the entire length. The roller tables are equipped with stops and kick-offs to transfer the rails to the straightening presses, of which there are 16, built by the Hilles & Jones Co., Wilmington, Del., these being of the usual type and motor driven. From the straighteners the rails are transferred by the usual skids to three-spindle vertical drill presses furnished by Wm. Sellers & Co., Philadelphia, Pa., which are also motor driven. These complete the rails for use. From the drill presses the rails are transferred to a roller table, which extends the full length of the building and from which the rolls may be skidded to the loading beds immediately outside of the building. The principal rail mill machinery was built and installed by the United Engineering & Foundry Co., Pittsburgh, Pa., with the exception of the finishing department which was erected by the Morgan Engineering Co., Alliance, Ohio. For the lifting tables and transfers Westinghouse motors are used.

In the rail mill a number of Cutler-Hammer automatic remote-control devices are installed, the most interesting of which are those designed for the control of the elevating and tilting tables, the bloom shear and the transfer. The elevating table on the 48-in. blooming mill, weighing about 250,000 lbs., is supported on huge bell cranks which are connected to a rotating crank driven by a 250-h.p. motor running at 150 r.p.m. By means of automatic controlling devices the throwing of a master lever starts the table from the low level position and raises it to the highest level, where it is automatically stopped. In lifting the table from the low to the high level, the rotating crank moves through an arc of 180 degrees and, on throwing the master lever to the reverse position, the crank revolves another 180 degrees in the same direction, bringing the table to the low level once more. The operation of raising or lowering the table can be accomplished in a period of two seconds, which is quite remarkable when the masses to be accelerated, slowed down and stopped are considered. Its arrangement is similar to that of the elevating table, one end being pivoted and the other end supported on a bell crank. The tilting table is driven by a 150-h.p. motor governed by a controller similar to that designed for the elevating table. The bloom shear is worked by a 75-h.p. induction motor and the pin on the clutch by a d.c. auxiliary motor of 5 h.-p. The circuit of this motor is interlocked with the controlling device for the 75-h.p. a.c. motor so that the former cannot be put in motion except when the latter is running at full speed. The latch is operated by a crank to which the 5-h.p. motor is geared. Pressure on a push button under control of the operator, causes the motor to run long enough to revolve the crank 360 deg., thereby releasing the clutch and returning the pin to the initial or "off" position.

Automatic controllers installed in connection with motors on the transfers make it possible for the operator to transfer the rail from one table to another by a simple throw of the lever, the motor being automatically stopped after the transfer has been completed. For the operation of cranes, tables and other apparatus in and about the rail mill, requiring direct current two 500-k.w. synchronous motors driving direct-current generators have been furnished by the General Electric Co.

The loading yard is provided with the usual inspection beds and two tracks, each about 1,400 ft. long, connected with the track system of the plant at both ends, thus avoiding any unnecessary shifting. The yard is also served by an 80-ft. traveling crane for the entire length of the finishing department, and by means of this the rails are placed directly on flat cars.

In loading steel rails the ordinary way has been to switch in on stub tracks, which require that the cars go out the same way. In the Gary plant the railroad tracks along the finishing department of the rail mills will be at a slight grade, so that they can be moved by gravity to the point where they are needed. The empty cars come in on one of the nine tracks forming the trunk line. They are then switched to tracks making a broad curve to the finishing department. As soon as loaded, they are sent down the tracks by gravity to the other end of the yard, where locomotives pick them up and haul them back to the trunk lines.

This movement of cars at the rail mill is typical of the plan of the entire plant. Everything keeps moving forward from the time the cars enter the great railroad system of the mills. There is little or no turning backward at any point. The movement is always forward. In this way the maximum capacity of service is secured and the danger of blockades reduced to a minimum.

All of the butts and scrap from the rail mill are loaded into cars from the conveyor above mentioned and carried back to the open hearth furnaces.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M. INST., C.E.

II.

The electrification problem in regard to any particular system of suburban railroads already operated by steam is to decide how far these advantages will counterbalance the large capital expenditure. If the mere reduction in operating expenses were to pay interest charges on this capital expenditure, there would not be much question, provided the necessary money were available, of the wisdom of adopting electric traction.

If, however, this be not the case—and it is very seldom the case—it becomes necessary, in order to judge the matter from

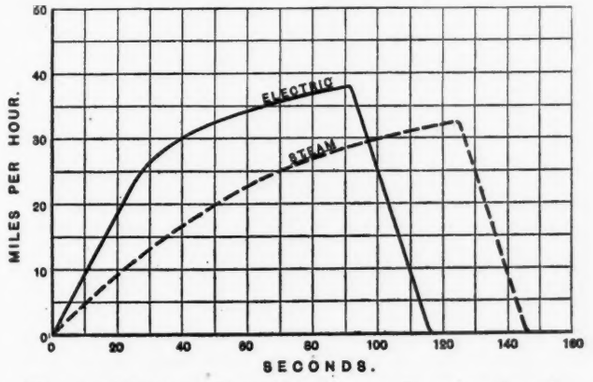


Fig. 1—Effect of Electrification on Running Speed.

a commercial standpoint, to put a value on the other advantages referred to and particularly to consider the probable increase of traffic due to the more frequent service which can, in nearly all cases, be profitably run when once electrical operation is introduced. It is also necessary to make an accurate estimate of the operating costs if the use of steam locomotives were continued. As has already been pointed out, electrical operation generally results in a considerable reduction in operating costs per train-mile, but if the service is to be increased in order to obtain the increase of traffic mentioned, it does not follow that the total operating costs will also be less. On the other hand, they should not, even taking into account the additional train-mileage, greatly exceed those with steam, especially on a system such as the Melbourne suburban system where there is already a fairly frequent service. In order to make an accurate comparison of the operating costs, it is necessary to decide on and compare the service of trains that would be given by the two systems. By service is meant not only the actual number of trains run, but also the schedule speed. Before discussing the former it may be well to explain in detail the effect of electrical operation on schedule speed and see in what respects this differs from steam operation.

The possibility of increased schedule speed is the characteristic feature of electrical operation, especially for a suburban service, that is, a service with frequent stops. An increase in schedule speed not only benefits the passenger by shortening the time of his journey, but it increases the desire to travel and, hence, the revenue of the system. It also enables a given amount of rolling stock and permanent way, and a given operating staff, to handle an increased traffic and, hence, to yield a greater daily revenue.

On suburban system, with frequent stops, such as that in Melbourne, what is primarily required in order to increase the schedule speed is a more rapid acceleration. Referring to Fig. 1 it will be seen that on a typical run of 0.825 miles on the level (the average length of run on the Melbourne suburban system) one of the present steam trains could cover the distance in 147 seconds, the speed increasing up to the time the brakes are applied. If we wish to reduce the time taken we must get up speed more quickly—in other words we must increase the acceleration.

The average acceleration obtained at present on the Melbourne suburban system with steam operation, as shown in Fig. 1 by the dotted curve, is 0.36 miles per hour per second. The full curve shows the reduction in time taken for the run as a result of increasing the acceleration to 0.9 miles per hour per second. Numerous attempts have from time to time been made on other railway systems to obtain high acceleration with steam locomotives, but it is obvious that in the case of Melbourne this could not be done without new locomotives and, even then, the improvement which can be made is limited. On the other hand, with electrical operation accelerations up to two miles per hour per second have been obtained in practice.

In actual operation it is usual to take advantage of the high acceleration possible with electric traction and to accomplish as much as possible of each run by coasting. Fig. 2 illustrates this. It shows how, in ordinary working, the motor would accelerate the train from A to B where current would be cut off and the train allowed to coast from B to C, the speed getting gradually less due to friction and windage. At C the brakes would be applied in order to bring the train to rest at D, completing the run in 240 seconds. If, however, the time table be arranged so as to allow of the run under normal running conditions being accomplished as per the curve ABCD* it is always possible in emergency, as when it is desired to make up time, to allow the train to take current to C^1, at which point the brakes would be applied, bringing the train to rest at D^1 thus decreasing the time by 8 per cent., though with a greater expenditure of current. While this is a perfectly permissible way of operating the trains when they are late, or in emergency, and is a valuable feature of electric traction, it is not a course that would be adopted normally if the greatest economy were desired.

We have seen that it is the high acceleration possible with electric traction, and more particularly with the system of propulsion by motors distributed along the train and known as

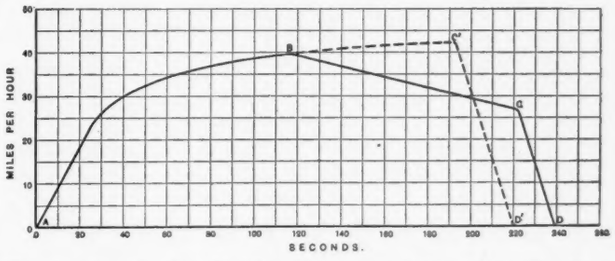


Fig. 2—Margin for Making Up Time With Electrification.
Direct-current characteristics assumed.

the multiple-unit system, which makes an increase in speed possible. The decision as to the schedule speed and acceleration to be used is fundamental and one of the starting points of all calculations relating to electric traction.

Very high schedule speeds cannot, however, even with electric traction, be obtained for nothing—in other words, the higher the schedule speed the greater the first cost of the equipment and the expenditure of power. The first question, therefore, which has to be settled in considering the basis on which a comparison should be made between the costs of steam and electrical operation, is the schedule speed we are to adopt compared with the existing schedule speed. If, on the one hand, the only desire is to give the public a better service, independent of financial considerations, the schedule speed is limited only by the maximum acceleration possible and which

*Abstract of the Report to the Victorian Railways Commissioners on the Application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the Commissioners.

*In order to accomplish this, it is worth while in practice to erect posts where current should normally be cut off.

can be adopted consistently with comfort to passengers. If, on the other hand, one were to be content with the present schedule speeds, and were only to consider electrical operation from the point of view of securing the other advantages previously mentioned, it would be possible to reduce considerably the capital cost of converting the system, and the operating expenses.

It has been the starting point in these calculations that some increase in schedule speed is desirable, although the present speed of the suburban trains is considerably better than that

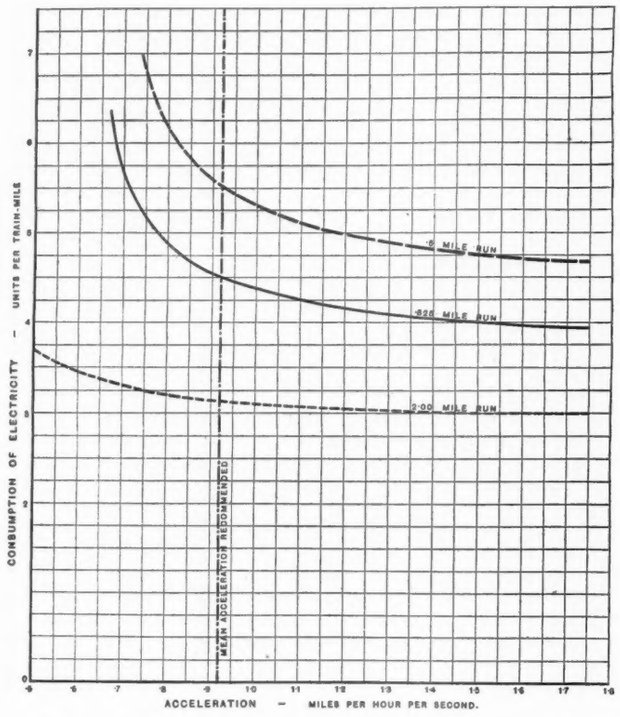

CONSUMPTION OF ELECTRICITY — UNITS PER TRAIN-MILE
ACCELERATION — MILES PER HOUR PER SECOND.
MEAN ACCELERATION RECOMMENDED
3 MILE RUN
2·25 MILE RUN
2·00 MILE RUN

Fig. 3—Effect of Acceleration on Power Consumption.
Direct-current characteristics assumed.

obtained to-day in many cities. The suburban system of Melbourne is, however, for reasons already touched on, of exceptional importance, and as the electrification of the railways would form a fitting opportunity for increasing the schedule speed, I have gone very closely into the question as to how far in this direction it would be practicable to go having regard to commercial considerations. I have reached the conclusion, after studying fully the effect of various other schedule speeds, both higher and lower, and the consequent financial results, that an increase of 25 per cent. in the average speed of trains over the system is the correct limit, taking everything into consideration, and I think this improvement ample to justify the figures to be discussed in a future issue as to the increase in passenger receipts to be anticipated.

Schedule Speed and Length of Average Run on Various Electric Railways.

Railway.	Length, single line, miles.	Av'ge distance between stops, yds.	Schedule speed in miles per hour.
Boston Elevated	16	2,400	13.0
Central London	13	840	14.0
Lancashire & Yorkshire*	69	2,290	30.0
Liverpool Overhead	13	670	19.0
London Metropolitan District	56	1,042	15.7
Manhattan Elevated	118	1,775	14.7
New York Central (New York)	85	4,600	21.0
New York Subway	55	2,030	16.0
North-Eastern (Tynemouth Branches)	73	2,000	20.5
North-Western Elevated (Chicago)	25	1,320	10.0
Prussian State Rys. (Hamburg-Altona)	45	2,190	19.1
Penn. R. R. (West Jersey & Seashore)	160	8,800	28.8
Paris Metropolitan	30	540	16.2

*Liverpool & Southport.

The accompanying table gives particulars of the schedule speeds on various systems operated electrically, the actual schedule speed on any particular system being controlled to a great extent by the average length of run.

Assuming, therefore, that a schedule speed of 25 per cent. higher than that of the present trains is a set requirement, it remains to examine what acceleration and motive power this will involve. The present schedule speed on the average over the whole suburban system is 16 miles per hour.

The actual acceleration to be adopted must be considered concurrently with various factors; it must be so chosen that it is at least sufficiently high to admit of the desired schedule speed being maintained under the ascertained conditions of service (of which the most important is the frequency of stops) with a fair margin. This has the double advantage of enabling the driver to make up lost time and of economizing current under normal conditions as part of each run is accomplished by coasting (see Fig. 2). On the other hand, the acceleration is limited (1) by the comfort of passengers (2) by the cost (and weight) of motors and of all those portions of the distributing system whose cost depends on the maximum current required by one train, (3) by the slipping of the driving wheels, which is, of course, bound up with the question of the number of coaches equipped with motors. These considerations are almost entirely independent of the type of current adopted and the method by which it is conveyed to the train and can, therefore, be discussed independently of these questions.

Calculations have been made as to the effect on the consumption, of varying the acceleration, and the results have been embodied in the curves shown in Fig. 3, a study of which will show that the gain in economy by raising the acceleration

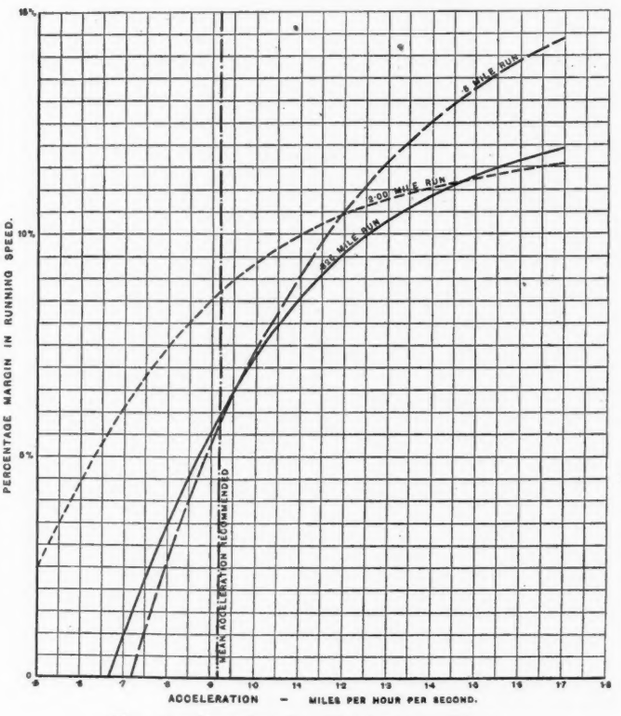

PERCENTAGE MARGIN IN RUNNING SPEED.
ACCELERATION — MILES PER HOUR PER SECOND.
MEAN ACCELERATION RECOMMENDED
3 MILE RUN
2·00 MILE RUN
2·25 MILE RUN

Fig. 4—Margins for Making Up Time.
Direct-current characteristics assumed.

above one mile per hour per second is comparatively small for the schedule speed chosen, while the increased consumption of electricity, if an acceleration less than 0.8 be chosen, is very marked indeed. Fig. 4 shows the margin of speed at the disposal of the driver for making up lost time on different lengths of run.

(To be continued.)

The mileage of railroads in operation in Brazil on January 1, 1908, was 10,915; the mileage actually being built was 2,053, and plans have been approved for 4,142 miles more.

General News Section.

An officer of the Grand Trunk denies that the road is to install automatic block signals on its line from Montreal to Chicago. The telegraph block system is already in use.

Dr. Charles Siemens has just returned to England from Japan, where he has made an inspection of the railroads for the Japanese government with a view to their possible electrification.

At the Stevens Institute of Technology November 5, George L. Fowler, Associate Editor of the *Railroad Age Gazette*, gave a lecture on "Latest Locomotive Improvements." This was one of a series of lectures to be given under the auspices of the Engineering Society, an undergraduate association.

C. O. Johnson, Traffic Manager of H. J. Heinz Co., Pittsburgh, Pa., and President of the Individual Car Owners' Association at Pittsburgh, has resigned from the presidency of the Individual Car Owners' Association, and the duties of that office will be temporarily performed by W. E. MacEwen, First Vice-President.

It is said that the sheriff of Bent county, Colorado, may levy upon the rolling stock, tracks and other property of the Atchison, Topeka & Santa Fe for back taxes. The railroad claims that in 1905 the Bent county officials placed an assessed valuation of $546,416 on its 40 miles of track in that county, or of $13,650 per mile. It said that on the basis that other property was assessed, its assessment in the county should not have been more than $6,250 per mile. The county demanded $24,166 in taxes and the railroad contended that it should be expected to pay only $10,205. The assessment levied upon it, it said, was deprivation of property without due process of law, in violation of the federal constitution. The United States Circuit Court issued a temporary injunction to restrain the collection of the taxes, but on November 4 dissolved the injunction, saying, "equity will not relieve against an assessment merely because it happens to be at a higher rate than that of other property, if such inequalities are due to mistake or the fallibility of human judgment, for it is a matter of common knowledge and understanding that absolute uniformity cannot be maintained."

The Railroad Commission of Oregon has completed an investigation of the original cost and cost of reproduction of the lines of the Oregon Railroad & Navigation Company and of the Corvallis & Eastern. From the report of the Oregon Railroad & Navigation Company to the Commission it appeared that the original cost of construction and equipment and of betterments and additions on the lines in Oregon, excluding the Columbia Southern, the Columbia River & Oregon Central and the Umatilla Central, was $33,297,828. The estimate of the Commission's engineer of the cost of reproducing the lines and equipment is said to be $35,067,195, but this, it is stated, does not include the right-of-way and grounds, costing $290,000, which sum increases the total estimated expense of reproduction to $35,357,195. The testimony of Wallis Nash, who disbursed the money for construction of the Corvallis & Eastern, was that he had disbursed $4,250,000, but this included $200,000 spent to hold a right-of-way in Malheur county and other sums expended on the Willamette river and for steamboats and ocean-going tugs at Yaquina Bay. The Commission's engineer therefore estimates the cost of reproduction of this road, with equipment, at $3,912,322. The total mileage of the Oregon Railroad & Navigation Company covered is 544, making the valuation upon it $63,325 per mile. The length of the Corvallis & Eastern is 142 miles, making an average estimated valuation for it of $27,550 per mile.

Telephones on the Canadian Pacific.

The Canadian Pacific, which proposes to use telephones for train despatching throughout its main line, from Montreal to Winnipeg, has completed its telephone line (which is strung on the telegraph poles) from Montreal to North Bay, 360 miles, and from North Bay, 384 miles further west (to White river); and the whole line will be finished as fast as the double track is put in use between Fort William and Winnipeg. The two circuits now in use are imposed on two through telegraph duplex circuits. The telephones here are not yet used for despatching. Telephonic conversation can be carried on on each of the two circuits simultaneously with the exchange of four telegraph messages between Montreal and Winnipeg.

Another installation of the same nature is between Medicine Hat and Calgary, a distance of 180 miles, which is worked on two telegraph duplex wires working between Calgary and Winnipeg. The road has a number of shorter sections where the telephone is used in combination with the telegraph wires, for instance, between Montreal and Farnham, Moosejaw and Regina, and at isolated points where there is no telegraph operator, connecting such points with a nearby telegraph station. Mr. Kent, Manager of Telegraphs, says that practically the whole of the main line and a large part of the branches in British Columbia are traversed by independent telephone circuits connecting the numerous watchmen with each other and with telegraph stations. There is also a telephone circuit between Banff, Laggan, Lake Louise, Field and Emerald Lake. The telephone has been used several months between Montreal and Farnham for train despatching and the circuit has now been extended to Newport, Vt. On all circuits used for telephoning, whether composite with telegraph circuit or independent, the Canadian Pacific uses pairs of copper wires weighing 210 lbs. each per mile. The wires are transposed in their location on the poles every half mile.

Finances of Chicago & Milwaukee Electric Railway.

Arthur Young & Co., certified accountants, who were appointed by Judge Peter S. Grosscup, of the United States Circuit Court at Chicago, to investigate the accounts of the Chicago & Milwaukee Electric Railway, which is now in the hands of receivers, are said to have made a report, indicating that the indebtedness of this road is much in excess of what it has cost. The accountants say that the cost of the Wisconsin division was $2,250,000 and that it has a debt of $13,929,805, made up as follows: Bonds, $10,000,000; certificates, $1,000,000; floating debt, $2,169,000; uncompleted contracts, $760,805. It is stated the road and terminals in Milwaukee cost $188,000 and are in debt $478,000. The accountants say the cost of the original Illinois road was $1,080,000 and the cost of extensions $8,082,630, making a total of $9,162,630. The books of the construction company include in the cost of the line, $394,707 interest, and $946,165 freight and passenger receipts, which the accountants disallow. These deductions reduce the cost to $7,821,757.

To this the accountants add $289,567 in contract liabilities which are not on the construction company's books and which make the real net cost $8,111,324. Deducting current liabilities of $1,826,125, leaves the amount of cash that went into construction and equipment $6,285,199.

"The above are outside figures," say the accountants. "To represent a total bonded indebtedness of $15,080,000 and a floating indebtedness of $2,169,100, the railroad company has a property that cost at the outside $8,111,324."

It is stated that the company never earned enough to pay interest on its bonds, its deficits by years being as follows: 1903, $42,621; 1904, $153,645; 1905, $249,019; 1906, $395,211; 1907, $598,602. Gravel for grading came from pits owned by the road and was hauled for the construction company in the road's cars. A. C. Frost, President of the road, was also president of the construction company. It is stated that the construction company was charged a high freight rate which ostensibly swelled the freight earnings of the road in five years to $1,889,259, whereas if a reasonable rate had been entered on the books the earnings from freight would have been $301,083. It is also charged that passenger earnings

were padded to the amount of $462,702 in five years. The accountants say:

"From 1903 to date checks for various amounts varying from $500 to $3,000 were made out by A. C. Frost & Co., and used either in the purchase of tickets or sent directly to the treasurer at Highwood and credited as passenger receipts. Our investigation shows that these were not bona fide sales of tickets and should not be credited as passenger earnings.

"On A. C. Frost & Co.'s books these payments were first charged to an account called the Chicago & Milwaukee Electric railroad (general account), no corresponding account, of course, appearing on the railroad company's books. At the end of each year these sums were charged off as a loss in A. C. Frost & Co.'s profit and loss account. Subsequently, however, through a series of journal entries on the books of A. C. Frost & Co. and the Republic Construction Company, A. C. Frost & Co. were recouped either through getting bonds or by having their account with the railroad company credited."

It is claimed that it was in this way that the road was enabled to make it appear that it had net earnings of from $100,000 to $200,000 a year.

The accountants say: "It would require extended examination of the books of the railroad company, the Republic Construction Company, and especially of A. C. Frost & Co., to discover in detail what has become of the actual cash received from the sale of the bonds, etc." The president of the road and the Republic Construction Company is also President of A. C. Frost & Co.

Business Conditions.

On October 27, the members of the American Trade Press Association were asked to report the actual condition of business during the past few months and the prospects for 1909, in their respective fields. The membership of the association consists of most of the high class technical and trade papers in the East. The following are extracts from several replies, some of which were made before election:

American Grocer.—"The grocery trade feels a depression less than any other line of business and it changes in character rather than volume. The policy at present is to carry light stocks and make frequent purchases. There has been a tremendous decrease in sales on contract, which has forced manufacturers generally, and packers of canned goods in particular, to carry their output. The result was a decided decline in prices, until some lines were forced to sell below cost of production."

Northwestern Miller.—"The present condition and the future prospects of the milling business are satisfactory and encouraging. The flour mills throughout the United States as a rule had a fairly satisfactory season in 1907 and 1908, and the crop of wheat this year is ample in quantity and of exceptionally fine quality. From this the mills are able to make a very superior grade of flour, which is going far toward restoring the reputation of the American product abroad. We, therefore, hope for a larger export trade in flour this year than usual. The domestic trade will continue about normal."

House Furnishing Review.—"Our trade seems to be experiencing a somewhat slow, but steady, improvement. During the past month especially has this improvement been most noticeable. It cannot be said that there is any 'boom,' but a healthy growth is certainly apparent. Collections are still somewhat slow, but seem to be getting better."

Coal Trade Journal.—"There has been a considerable improvement in the coal trade in the past six weeks, as compared with the situation in the preceding six months. The demand for steam coal for manufacturing purposes has grown perhaps 5 per cent. within that period. Some of our largest carriers, which were reporting 20 per cent. less tonnage as compared with last year up to September 1st, are now reporting a loss of only 15½ per cent., and we think that within the next three months we shall be able to see this decrease approach more nearly 10 per cent. than 15. As to anthracite, which is a domestic fuel, there is not quite so much difference. The returns up to the first of October show only about 5 per cent. less tonnage than for the same period of last year."

Lumber Trade Journal.—"Assuming that Mr. Taft is elected, we believe we shall see an almost immediate revival in the lumber business. It will not be so apparent in New York City as elsewhere, because those who are engaged in making loans to builders in this city seem determined to eliminate a considerable undesirable element. We are going to have a good lumber business, however. The market will rise steadily."

Iron Age.—"The effect of the panic upon the iron industry was not fully appreciated until the slow recovery from it began last spring. There was a slight setback in June, but since the improvement has been fairly steady. October, 1907, was the record month of output, with 2,340,000 tons. In the first half of 1908, it fluctuated between 1,000,000 tons per month and 1,250,000 tons. Improvement began in August with 1,360,000 tons, September following with 1,420,000 tons and October with 1,570,000 tons. November promises to add 100,000 tons to the latter figure. Manufacturing concerns have suffered keenly from the withdrawal of work growing out of the absence of credit. A study of underlying causes, familiar to all, leads to the conclusion that recovery, which has been under way since spring, can only be expected to proceed slowly. The revision of the tariff is giving some concern to leaders in the iron industry; not so much on account of any readjustments which may increase competition from abroad, but because of the effect which the discussion is likely to have upon the attitude of buyers while it is in progress. A lowering in the rates of duty is interpreted by the buyer as equivalent to a reduction in price. While, of course, this does not follow, still the opinion is so generally held in the trade that it is pretty sure to lead to hesitation in placing orders. The outlook is for a heavy demand from the farming interests and a very satisfactory improvement in the volume of work from other quarters. We are hopeful of a return to normal conditions, which is far more conducive to the permanent welfare of the industry than short bursts of frenzied activity and long periods of almost hopeless depression."

Electrical World.—"The financial panic at the close of 1907 brought with it an instant cessation of development in new enterprises, such as the construction of hydro-electric systems, the extension of street railways and the building of new lighting plants. At present the product of electrical apparatus and supplies is back to about 60 per cent. of what it was a year ago—in some lines more—and should the political conditions favor, there is every reason to believe that early in 1909 the output will be equal to anything known during the best period of 1906, when high water mark was attained."

Railroad Age Gazette.—"The railroads consume about one-third of the total iron and steel and a large percentage of the lumber produced in this country, and every twelfth person depends upon the railroads for his or her support. The builders of railroad equipment and makers of supplies are amongst the first to feel any general business depression. The railroads stopped buying everything except bare necessities last fall and the plants devoted to making what railroads need, gradually, with few exceptions, either closed down entirely or worked but few hours a week. There was no material change until August last, when the railroads and manufacturers alike began to anticipate a safe and sane election. While the election has only just been decided, the result is highly satisfactory to the industry we represent. While reports of orders placed within the last two days have in some instances been grossly exaggerated, nevertheless there is a decided improvement and the indications are that the demands will be large and immediate."

Automobile.—"Present prospects are encouraging. The automobile industry is on a substantial basis, and many are doing an enormous business. The sales of one firm for 1908 have already amounted to more than $7,000,000. There have been some failures; but the general feeling is healthy, and conditions are much better than they were previous to the depression of 1907."

International Marine Engineering.—"In the marine field, business is quiet, largely because the railroads have not been able to raise the money needed to keep their floating equipment in proper condition. The limit seems to have been reached. There will be a large volume of repair work to floating equipment during the coming year and a considerable amount of new work in building tugboats, car floats, coastwise steamers, etc."

Boiler Maker.—"The boilermaking field has shown a considerable improvement during the past month or six weeks.

The best evidence of this is the fact that for nearly six months we scarcely had an inquiry from a manager or owner of a boiler shop for skilled labor. Within the past three or four weeks we have had a good many inquiries of this nature, showing that there is a demand for superintendents, master boiler makers, and other men to fill the best-paid positions in railroad and contract boiler shops."

An Exciting Deadly (?) Parallel.

Sedalia, Mo., Nov. 5.—Effective yesterday, all section-men employed on the Missouri Pacific, will receive an increase in wages from $1.25 to $1.35 a day. This is the first increase in railroad men's pay this year.

Parkersburg, W. Va., November 5.—Evidences of the renewed prosperity promised immediately following the election of Taft appeared here to-day, when all of the machinists, carpenters, repairmen and helpers employed in the Baltimore & Ohio yards (Ohio River Division), were notified that the working time had been reduced from ten to eight hours a day. The men who had voted for Taft let out a howl.

Car Repairs Under Safety Appliance Law.

The Interstate Commerce Commission has made a ruling regarding the repair of defective safety appliances on cars, which is expected to save much unnecessary switching which has had to be done under the rule heretofore in effect. The matter was taken up with Commissioner Cockrell of the Interstate Commerce Commission and E. A. Moseley, Secretary of the Commission, by Arthur Hale, Chairman of the Committee on Car Efficiency. The Commission had held that a receiving line could not receive in interchange from a delivering line a car having defective safety appliances. The consequence was that if a car, the safety appliances of which were already defective, was switched from one road to another, or if the safety appliances of a car became defective while it was being switched, the receiving line refused to accept it and it had to be hauled back to the delivering line. This not only caused much unnecessary switching at interchange points, which interfered with car efficiency, but also caused the safety appliance law to be violated by the hauling of the defective car back from the receiving to the delivering road. The new rule of the Commission, as embodied in instructions to its safety inspectors, is as follows:

"*Repairs to Cars Delivered in Interchange.*—The intent of the interchange agreement is that delivering roads shall repair defective safety appliances on all cars offered by them to their connections, before delivery is made, and the Commision has no authority to grant permission to receiving roads to move cars in a defective condition for any purpose. It sometimes happens that defects arise during the interchange movement, a car leaving the transfer track of a delivering road in perfect condition and arriving at the point of delivery to receiving road with broken uncoupling chain or other penalty defect. Carriers must decide for themselves how to treat such cases under the interchange agreement, having in mind that any movement of a car in such defective condition is a violation of the law."

In a letter to Mr. Hale, regarding the new rule, Mr. Moseley said:

"While we understand that these instructions in no way change the intent of the former instructions, in order that there may be no misunderstanding, we make such changes as are requested by you."

In a letter to J. W. Taylor, Secretary of the Master Car Builders' Association, Mr. Hale, commenting upon the new rule, says:

"You will note from this that there is no doubt that it is the duty of every railroad to repair a safety appliance defect at once, and if a receiving road con repair such a defect on the interchange track, it is the legal duty of the receiving road to do so.

"There is no provision in the law allowing the movement of any car with a defective safety appliance, and whenever a railroad does move such car it is involved in a certain amount of risk. You will note, however, the statement in the memorandum attached, that 'it has not been the rule of this Commission to report cases for prosecution where the movement is absolutely necessary for the purpose of repair.'

"Under this rule it would seem quite safe for us to move such cars to the nearest repair point, whether it be a point on the receiving or delivering road. Of course, the receiving road can save itself harmless by refusing the car, as is being done at present in a number of cases, but in such cases the delivering road takes the risk of hauling the car back. One question, however, is determined: that it would seem to be best for the receiving road to repair such cars on interchange tracks when this can be done. This does not at all relieve the delivering line from its duty of repairing such cars before offering them in interchange.

"Mr. Moseley and his inspectors seemed to be very much afraid that if the receiving road did make repairs it would result in negligence on the part of the delivering line. For myself, I feel quite certain that this would not be the case, and that if the receiving lines do make repairs on their interchange tracks, the delivering lines will redouble their efforts to put the cars in proper condition before they leave their yards."

An Automatic Electric Highway Crossing Gate.

On the Montreaux-Bernese Oberland electric railroad in Switzerland, which is worked by overhead wires, electrically-connected to the cars by bows, such as are used on the New York, New Haven & Hartford, an automatic grade crossing gate is being tried. At a certain distance from the crossing a parallel wire close to the main trolley wire is connected with the power by means of the trolley bow. This energizes the motor which lowers the gate across the highway. At the same time an electric bell is sounded and a light is displayed to give warning that a car is approaching. The gates are lowered in about 20 seconds. After the car has passed they are raised by a counterweight.

The President and the Sweeper.

When a conductor of a Lackawanna train walked in from the Hoboken train-shed to make his report at the office, he was stopped by a tall, iron-gray man, who held out his hand with a greeting.

"Good morning, Parsons. How's the rheumatism?"

"Better, sir; said the conductor, "but I guess it will get me again in December. It always does. How are you?"

"Pretty well—and we're keeping the railroad running all right. Glad to see you are cutting down the 'lates' since the signals are working better. Keep it up. And don't forget to take care of yourself—good bye."

As he went on to the ferry, he stopped four times in fifty yards to speak to different men—a starter, a station-sweeper, another conductor, and a man in plain clothes. What he said probably did not amount to much, but it seemed to mean something to the men.

This was W. H. Truesdale, the president of the Lackawanna road. The men to whom he talked were men of the railroad staff, upon whose aggregate performances rests the reputation of the road. How much of its success is due to just this spirit shown by his greetings to his men, no one can say accurately. But it is pleasant to record that a busy president finds time enough in crossing the ferries to exchange the time o'-day with station sweepers, engine wipers, and men of the road.—*World's Work.*

Contributory Negligence—A Bit of Philosophy.

When anybody is struck by a trolley car or an automobile, it almost always happens that the victim is apparently somewhat to blame. A man will get off a trolley car without looking to see if anything is coming, and he will get a fatal knock for it. A woman will gently step backward off a car which hasn't quite stopped and she's down and out. You can say it is their fault; but, if the approaching vehicle had been under such control that the careless person might have been avoided, or, if the trolley, instead of moving, had stopped short, then neither kind of accident referred to would have happened.

The point of it is that this semi-carelessness is chronic and a part of the average human make-up. It must be allowed for, and people driving fast vehicles must have it all the time on their minds. To neglect this is to jeopard the public

safety. If the death penalty is to be silently prescribed for everybody who for a moment relaxes his care and watchfulness, then there will be so few people left that trolley cars can thunder by and automobiles can break records and nobody will be hurt.

Before we get things all adjusted, it will develop that no trolley car will be let pass a stationary car except at the slowest pace. Steam cars are forbidden to pass at all. The fastest express will halt outside of Newington, if there is an accommodation train at that station. It has to. Similarly, when a trolley car approaches a car that has stopped, it should practically stop itself. The situation is a notice that people are getting off and are liable to step out on the wrong track.

In the same way an automobile driver, when he sees a trolley car stop, must conclude for himself that somebody is going to step off and must be ready to turn aside or to stop short, if necessary. Rushing past is unpardonable. These things should be absolutely prescribed and held to, and there should be a few reckless automobilists looking out through jail bars to emphasize the public sentiment as to carelessness. —*Hartford Courant.*

St. Louis Railway Club.

The regular monthly meeting of the St. Louis Railway Club will be held in the parlors of the Southern Hotel at 8 o'clock in the evening of Friday, November 13. John J. Baulch, President of the club, will present an attractive paper entitled "Are Railway Clubs Worth While?"

American Railway Association.

The fall session of the American Railway Association will be held at the Auditorium Hotel, Chicago, on Wednesday, November 18, at 11 a.m. Reports will be presented by the Executive Committee and the Committees on Train Rules, on Car Service, on Safety Appliances, on Interlocking and Block Signals, on Accounting and Statistical Inquiry, on Transportation of Explosives, on Standard Location for Third Rail Working Conductors, and on Car Efficiency. The election of a First Vice-President will take place at this meeting.

New York Railroad Club.

The next regular meeting of the New York Railroad Club will be held at the building of the United Engineering Societies, 29 West Thirty-ninth street, New York, on Friday evening, November 20, 1908, at 8 o'clock. W. J. Harahan, Assistant to the President of the Erie, will read a paper on "A Search for Those Elements the Proper Combination of Which Constitute the Successful Railroad Official." Harry D. Vought, Secretary, 95 Liberty street, New York.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries and dates of next or regular meetings.

Air Brake Association.—F. M. Nellis, 53 State street, Boston, Mass.; June, 1909.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th street, New York; second Friday in month.
American Railway Association.—W. F. Allen, 24 Park Place, New York; November 18, 1908.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M. R.R., Concord, N. H.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, 962 Monadnock Building, Chicago; March 16-18, 1909.
American Railway Master Mechanics' Association.—J. W. Taylor, 390 Old Colony Building, Chicago; June, 1909.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th-street, New York; 1st & 3d Wed. in month, except July and Aug.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 West 39th street, New York; December 1 to 4, 1908.
American Street and Interurban Railway Association.—B. V. Swenson, 29 West 39th street, New York.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn street, Chicago, last Wed. in April, 1909.
Association of Railway Claim Agents.—C. L. Young, C. & N.-W. Ry., Chicago, Ill.; May, 1909.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wis. Central Ry., Chicago; June 23-25, 1909.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park place, New York; December 8, 9, 1908.
Canadian Railway Club.—Jas. Powell, Grand Trunk Ry., Montreal, Que.; first Tuesday in month, except June, July and August.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; January.
Central Railway Club.—H. D. Vought, 95 Liberty street, New York; second Friday, in January, March, May, Sept. and Nov.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909.
International Master Boiler Makers' Association.—Harry D. Vought, 62 Liberty street, New York; May, 1909.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Iowa; second Friday in month, except July and August.
Master Car Builders' Association.—J. W. Taylor, Old Colony Building, Chicago, Ill.; June, 1909.
New England Railroad Club.—G. H. Frazier, 10 Oliver street, Boston, Mass.; 2d Tues. in month, except June, July, Aug. and Sept.
New York Railroad Club.—H. D. Vought, 95 Liberty street, New York; third Friday in month, except June, July and August.
North-West Railway Club.—T. W. Flannagan, Soo Line, Minneapolis, Minn.; 1st Tues. after 2d Mon. in month, except June, July, Aug.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; fourth Friday in month, except June, July and August.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden street, Bethlehem, Pa.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; second Friday in month, except June, July and August.
Southern and Southwestern Ry. Club.—A. J. Merrill, 218 Prudential Bldg., Atlanta, Ga.; 3d Thurs. in Jan., April, Aug. and Nov.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.
Western Railway Club.—J. W. Taylor, 390 Old Colony Bldg., Chicago, Ill.; 3d Tuesday each month, except June, July and Aug.
Western Society of Engineers.—J. H. Warder, Monadnock Building, Chicago; first Wednesday, except July and August.

Traffic News.

The railroads between Lake Erie and New York announce reductions in grain rates eastbound, to go into effect December 1. The reduction in nearly every case is one cent per 100 lbs.

The Texas lines will make holiday rates of one and one-third for the round trip between points within the state. Tickets will be sold on December 18, 19, 23, 24, 25, 26 and 31 and January 1, good for return as late as January 5.

On the New York, New Haven & Hartford, freight traffic is increasing, and on some divisions has lately shown aggregates nearly as large as those of last year. On some days the number of cars moved across the Poughkeepsie bridge, counting both eastbound and westbound, has been over 1,000.

At a meeting of the Western Passenger Association in Chicago on November 5, Eben E. MacLeod, Chairman of the association, was appointed a committee to confer with other passenger associations regarding the maintenance of a minimum 2-cent passenger fare all over the country. Suburban rates would, of course, be unaffected.

The Erie road is to run an agricultural special November 23, 24 and 25 for the benefit of the farmers along its lines. The lecturers are to be members of the faculty of the New York State Agricultural College (Cornell University), to whom Mr. Jackson, Industrial Commissioner of the road, offered the facilities of the train several months ago. The train will be run from Binghamton to Corning; Corning to Attica, by way of Avon, and from Attica to Corning, by way of Hornell.

The United States Circuit Court of Appeals at Chicago, Judges Grosscup, Seaman and Baker, rendered a decision on November 10, refusing the petition of the government for rehearing in the case of the government against the Standard Oil Company of Indiana, for the alleged acceptance of rebates from the Chicago & Alton. This is the case in which the Circuit Court of Appeals reversed and remanded the decision in the District Court and disapproved the fine of $29,400,000 imposed by Judge Landis.

The Indianapolis Lighting & Heating Company has filed a petition with the Indiana Railroad Commission asking for a modification of car service rules in Indiana. When cars are held beyond the free time of 48 hours they are charged demurrage at the rate of $1 a day. The complainant asked that the charge be reduced to 25 cents a day. The only basis for the complaint seems to be that the company is a public service corporation and that it believes that such a corporation should not be charged more demurrage than 25 cents a day.

The Indianapolis Freight Bureau, on behalf of shippers of sugar and coffee in Indianapolis, has filed a complaint with the Interstate Commerce Commission, alleging that the Illinois

Central and the Indianapolis Southern discriminate against Indianapolis in favor of Louisville, Evansville and St. Louis in rates on sugar and coffee from New Orleans. It is stated that the rate to Indianapolis is 23 cents per 100 lbs., on coffee and 25 cents on sugar, while to the other cities the rate is 17 cents on coffee and 23 cents on sugar. The Commission is asked to reduce the differential on sugar to 1 cent and on coffee to 1½ cents.

The Railroad Commission of Arkansas on November 4 issued an order prohibiting the railroads in the state from collecting the 3 cents a-mile rate that they put in effect after the United States Circuit Court issued an injunction restraining the Commission from enforcing the state 2-cent fare law. Most of the rate cases in Arkansas were brought by stockholders of the roads not only to restrain the Commission from enforcing the reduced rates but also to restrain the roads from accepting them. The Commission's order therefore puts the roads in a position where they must either disobey the Federal Court or disobey the new order of the Commission. They will continue to collect the 3-cent fare.

The Pennsylvania Farmers' Special, noticed last week, started from Philadelphia November 10. Large circulars had been posted at the stations at which the train stops with the announcement "Nothing to sell or advertise." Farmers desiring to hear more than one lecture were invited to accompany the train as far as they liked. The Long Island Railroad—a Pennsylvania subsidiary line—announces that its experimental farm, started two years ago on some of the "waste" land on Long Island, with two experiment stations, is attracting many settlers to Long Island. The methods used on these ideal farms are being adopted by other farmers on Long Island, and they are increasing the quality and quantity of their products.

Commissioner Harlan has given an informal opinion to a traffic officer in Chicago that the practice of switching trap cars free to and from plants having private tracks is illegal. Cars have been shipped in and out free for concerns at Chicago that could load 5,000 lbs. or more of less than carload freight. The goods have then been transferred by the roads from the trap cars into the various cars that took them to their various destinations. Some time ago the Chicago lines announced that they would discontinue this service or impose a charge to cover the extra service. Commissioner Harlan holds that an extra charge must be inserted in tariffs to cover the service and that if it continues to be rendered to large shippers the roads must also place cars on their team tracks for the convenience of small shippers or they will be guilty of unfair discrimination. The large mail order houses in Chicago have been the chief beneficiaries of the free service rendered.

The P. P. Williams Company, of Vicksburg, Miss., has filed a complaint with the Interstate Commerce Commission stating that the present rates from Vicksburg to points in Texas are inequitable as compared with the rates to the same points from Memphis, St. Louis, New Orleans, Galveston and other trade centers in the southwest. The complainant points out that the mileage from Vicksburg to numerous Texas points is less than from New Orleans or Memphis and about equal to the distance from Galveston, but that nevertheless the rates from Vicksburg have been practically the same as from New Orleans to Memphis and higher than from Galveston. The complainant says that when he has complained of the alleged discrimination in rates he has always been told that the Texas connections of the Vicksburg, Shreveport & Pacific would not consent to a reduction in rates from Vicksburg below the rates from Memphis and New Orleans. The Commission is asked to fix a proper basis for making rates from Vicksburg.

The Delaware, Lackawanna & Western has asked the United States Circuit Court of Appeals for an injunction restraining the Interstate Commerce Commission from enforcing an order requiring the company to change its rule relative to shipments of goods made by shipping agents from points in the west to the seaboard. The regulations require all forwarding agents to specify each separate consignment and furnish the names of the consignor and consignee. The Export Shipping Company, now in bankruptcy, complained against this rule, and the Interstate Commerce Commission, sustaining the complaint, issued the order abrogating the railroad company's regulation. It was the custom of the Export Shipping Company to get together shipments from a large number of consignors having less than full carload shipments, and combine them in one lot at carload rates, saving the individual consignors the difference between the carload rates and the less than carload rates. The Commission aimed to make the railroad accept freight for transportation according to the physical carload. Judge Lacombe agreed to render a decision before the order of the Commission becomes effective December 1.

The presentation of evidence in the suit brought by 18 railroads in Missouri to have the State Railroad Commission and the Attorney-General permanently enjoined from enforcing the reduced passenger and freight rate laws of that state was begun in the Federal Court before Judge Smith McPherson at Kansas City on November 9. Each of the roads will present statistics to show the bad effect upon their earnings which it is alleged the 2 cent fare law has caused and that the commodity rate law would cause if enforced. Frank Hagerman, counsel for all of the roads, presented a preliminary statement tending to show that seven of the roads had lost money through the legislation and that the earnings of the other companies had been reduced. Herbert S. Hadley, Attorney-General, who has been elected governor of Missouri, in a statement of the case of the state, said it admitted it is more expensive to handle intrastate than interstate freight business, but contended that the state passenger business was less expensive than interstate passenger business to handle because passengers on longer hauls pay a lower rate per mile and the equipment on the through trains is more expensive than that on local trains.

STATE COMMISSIONS.

Street railway companies have been forbidden by the Pennsylvania State Railroad Commission to allow passengers to ride on the front platforms of closed cars, or to allow more passengers to ride on the front platform of open cars than can be given seats.

The Railroad Commission of Texas has issued an order suspending the rule requiring cotton to be stopped at the first compress en route to destination, except as to compresses at Austin, Schulenburg, Seguin and Giddings. The Commission had received numerous complaints of blockades at compresses and delays in handling cotton at points of destination and concentration.

The right of a railroad company to grant an exclusive franchise to one baggage transfer company to use its station is in general denied by the Pennsylvania State Railroad Commission, the commission holding, however, that if the service rendered by one transfer company is adequate to the needs of the public, the railroad company may give that transfer company an exclusive franchise. In accordance with previously rendered court decisions, the commission holds that a transfer agent as such has no right to demand privileges in a railroad station, but if such privilege is granted to any transfer agent, then the service rendered must be adequate or the privilege be extended to other agents by the railroad company.

Application by the Brooklyn Rapid Transit Co. for a franchise for an elevated structure on the Flatbush avenue extension, and the exclusive rights to certain tracks on the new Manhattan bridge over the East river between Brooklyn and New York, has been denied by the New York State Public Service Commission, First district. One of the arguments against the granting of this exclusive franchise was the fact that if such a franchise were granted, the Brooklyn Rapid Transit would run cars from Brooklyn only as far as the Manhattan end of the bridge, making a situation similar to that on the old Brooklyn bridge. The commission is opposed to any franchise to a company intending to make its terminal at the end of the bridge, its opinion being that traffic conditions are such that the public can be better served by lines running from points in Brooklyn to points in Manhattan beyond the end of the bridge.

REPORT OF REVENUES AND EXPENSES OF RAILROADS

MONTH OF SEPTEMBER, 1908.

See also issue of November 6.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations,	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with 1907.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Baltimore & Ohio	3,992	$4,702,638	$1,273,312	$6,315,210	$746,999	$955,668	$129,772	$1,999,195	$117,982	$3,949,616	$2,365,594	$37,681†	$163,778	$2,164,134	‡$92,972
Boston & Maine	2,242	1,936,393	1,458,399	3,648,191	555,454	366,508	46,284	1,619,618	79,194	2,667,058	981,133	8,113	138,918	850,329	99,647
Central of New Jersey	668	1,389,195	392,631	1,882,796	180,161	315,921	27,386	477,760	35,254	1,036,482	846,314	47,272	87,432	806,154	‡49,879
Chesapeake & Ohio	1,896	1,785,370	431,876	2,308,999	287,898	436,002	37,097	574,422	39,173	1,374,593	934,406	4,350†	65,900	864,157	‡29,786
Chicago & Alton	998	715,209	367,422	1,171,481	105,775	115,367	37,458	335,568	29,422	623,590	547,891	1,677†	30,000	516,213	108,964
Chicago, Milwaukee & St. Paul	7,516	4,337,296	1,356,074	6,105,872	892,140	646,983	105,235	1,898,791	83,513	3,626,662	2,479,210	36,659	197,543	2,318,326	264,073
Chicago, Rock Island & Pacific	7,402	3,422,624	1,710,558	5,434,606	868,448	647,103	110,900	1,730,350	121,285	3,478,086	1,956,520	12,053†	188,839	1,755,628	132,044
Cincinnati, Hamilton & Dayton	1,036	496,814	170,154	717,908	92,021	132,609	22,872	264,405	19,204	531,111	186,797	3,234	24,725	165,306	8,968
Cleve., Cincinnati, Chicago & St. L.	1,982	1,374,257	690,045	2,282,243	281,831	335,674	73,463	833,655	39,705	1,564,328	717,915	1,379†	26,244	690,292	‡64,580
Delaware & Hudson	845	1,261,199	345,591	1,642,658	153,564	155,131	15,894	504,026	38,723	867,338	775,320	446†	35,000	739,874	‡160,381
Denver & Rio Grande	2,510	1,327,160	556,319	1,977,292	234,295	270,908	41,766	587,037	45,204	1,179,210	798,082	11,557	67,000	742,639	60,284
Galveston, Harrisburg & San Antonio	1,343	736,324	166,478	942,594	82,943	104,773	20,772	331,125	26,127	565,740	376,854	1,381†	18,985	356,488	192,126
Houston & Texas Central	789	431,021	119,799	583,162	63,477	68,448	15,584	187,665	18,477	353,651	229,511	.....	9,010	220,501	61,391
Illinois Central	4,509	3,022,876	988,641	4,558,475	612,049	1,256,982	111,843	1,507,922	91,119	3,579,915	978,560	359	185,892	793,027	‡178,862
Lake Erie & Western	724	286,406	86,881	389,845	60,510	73,193	12,514	142,739	10,021	298,977	90,868	.....	17,000	73,868	‡75,799
Lake Shore & Michigan Southern	1,508	2,192,790	923,877	3,571,541	508,375	548,636	84,165	1,068,288	58,914	2,268,378	1,303,163	3,254	110,001	1,196,417	‡194,693
Maine Central	931	420,186	324,608	791,668	151,333	93,947	7,789	247,053	22,336	522,458	269,210	2,832	31,622	240,420	‡75,636
Michigan Central	1,746	1,390,627	632,435	2,201,582	284,339	271,632	52,283	831,065	34,605	1,473,924	727,658	2,542†	97,000	628,115	‡72,579
Missouri, Kansas & Texas	3,072	1,642,082	618,645	2,371,747	294,115	399,581	41,309	732,436	61,958	1,529,399	842,348	2,647	114,700	730,295	‡77,289
Nashville, Chatt. & St. Louis	1,230	625,364	240,790	930,219	128,424	169,286	30,359	324,843	26,833	679,745	250,474	1,020†	20,000	229,454	‡48,542
New York Central & Hudson River	3,588	4,211,605	2,802,794	7,815,218	969,933	1,426,853	177,804	2,619,757	152,040	5,346,387	2,468,831	8,044†	297,478	2,163,308	‡328,479
New York, Chicago & St. Louis	553	586,780	135,487	749,026	98,978	67,983	42,285	280,700	11,885	501,831	247,195	488†	28,000	218,707	‡18,573
New York, New Haven & Hartford	2,004	2,251,892	2,176,509	4,819,232	622,967	591,518	25,879	1,832,249	84,599	3,157,212	1,662,020	137,835	284,435	1,515,420	‡141,280
Oregon R.R. & Nav. Co.	1,264	975,738	321,221	1,361,256	114,832	73,430	18,842	308,607	28,239	543,950	817,306	2,597†	42,163	772,546	252,613
Oregon Short Line	1,456	996,450	363,443	1,446,069	204,192	126,671	17,757	268,241	30,985	647,846	798,223	1,866	48,083	752,006	60,354
Pere Marquette	2,354	820,675	359,788	1,269,002	152,061	175,064	26,512	453,592	28,659	835,888	433,114	5,749	52,333	386,530	99,615
St. Louis & San Francisco	4,727	2,045,744	854,627	3,136,504	508,131	426,915	59,890	1,033,731	92,900	2,121,566	1,014,938	.....	148,428	866,510	23,098
San Antonio & Aransas Pass.	727	289,652	72,985	377,901	40,709	33,871	3,972	125,660	8,660	212,872	165,029	.....	8,500	156,529	6,153
San Pedro, Los Angeles & Salt Lake	1,099	347,150	200,758	582,391	102,441	78,685	25,884	181,375	15,724	404,110	178,281	1,727†	24,713	151,841	121,269
Seaboard Air Line	2,611	887,104	259,128	1,256,842	205,909	175,044	46,086	440,188	48,170	915,397	341,445	1,043†	50,500	289,902	27,603
Texas & Pacific	1,885	815,748	311,606	1,192,888	128,298	180,926	12,726	433,136	31,738	786,825	406,064	791	79,113	327,742	9,676
Union Pacific	3,301	3,252,772	930,849	4,481,493	463,611	381,209	83,406	896,485	78,261	1,902,972	2,578,521	4,104	107,662	2,474,962	1,052,638
Wabash	2,515	1,505,851	640,584	2,319,906	261,321	319,798	72,801	821,308	61,815	1,537,043	782,863	1,630†	72,673	708,560	‡102,032
Yazoo & Mississippi Valley	1,371	517,205	166,780	729,694	225,874	191,905	18,348	326,252	23,417	785,800	56,106*	3,348	34,590	87,348†	‡116,329
THREE MONTHS OF FISCAL YEAR.															
Baltimore & Ohio	3,992	13,709,594	3,734,830	18,409,566	2,296,880	2,527,404	404,089	5,938,171	353,780	11,520,324	6,889,242	112,471†	496,624	6,280,147	‡535,722
Boston & Maine	2,242	5,375,548	4,304,330	10,442,704	1,429,692	1,044,900	128,842	4,387,275	218,386	7,209,095	3,233,609	36,759	413,189	2,857,179	‡407,833
Central of New Jersey	668	3,771,055	1,255,065	5,315,753	546,357	936,661	84,323	1,428,473	107,480	3,103,294	2,212,459	292,706	262,716	2,242,449	‡512,301
Chesapeake & Ohio	1,896	5,130,844	1,294,810	6,697,036	839,962	1,205,282	109,966	1,708,074	122,033	3,985,317	2,711,719	7,229†	197,700	2,506,790	‡167,294
Chicago & Alton	998	2,000,761	1,113,161	3,379,492	295,268	332,334	108,498	935,061	83,798	1,754,959	1,624,533	4,886†	90,000	1,529,647	457,214
Chicago, Milwaukee & St. Paul	7,516	10,910,623	3,969,566	16,097,742	2,158,712	1,746,388	307,255	5,332,780	247,708	9,792,843	6,304,899	112,195	592,629	5,824,465	‡134,394
Chicago, Rock Island & Pacific	7,402	9,049,133	4,954,675	14,884,738	2,338,849	1,866,128	325,882	5,134,361	367,030	10,032,250	4,852,488	22,629†	522,383	4,307,476	199,037
Cincinnati, Hamilton & Dayton	1,036	1,445,465	507,189	2,101,254	261,163	396,542	66,954	811,919	58,974	1,595,553	505,701	11,052	75,384	441,369	‡21,799
Cleve., Cincinnati, Chicago & St. L.	1,982	3,970,411	2,084,209	6,665,269	796,315	878,215	216,249	2,416,281	124,864	4,431,924	2,233,345	3,836†	171,131	2,058,378	35,533
Delaware & Hudson	845	3,531,293	1,029,919	4,685,605	452,774	494,435	63,971	1,537,487	105,091	2,653,758	2,031,847	2,106	105,000	1,928,953	‡505,509
Denver & Rio Grande	2,510	3,592,511	1,577,419	5,426,516	686,217	712,530	121,344	1,653,703	141,179	3,314,973	2,111,543	32,910	192,000	1,952,453	‡245,846
Galveston, Harrisburg & San Antonio	1,343	1,824,215	519,716	2,463,964	251,545	281,596	57,499	984,676	81,161	1,656,477	807,487	4,528†	78,660	724,299	300,602
Houston & Texas Central	789	1,030,847	376,727	1,502,833	194,618	191,136	44,189	563,237	56,834	1,050,014	452,819	.....	40,160	412,659	11,566
Illinois Central	4,509	8,392,860	3,002,861	12,947,562	1,907,345	3,337,062	300,381	4,467,794	273,525	10,286,107	2,661,455	579	561,491	2,100,543	‡770,698
Lake Erie & Western	724	836,140	270,023	1,165,573	172,478	203,785	37,516	422,109	31,688	867,576	297,997	.....	51,000	246,997	‡111,379
Lake Shore & Michigan Southern	1,508	6,387,377	2,889,543	10,550,688	1,508,980	1,429,905	241,031	3,125,636	167,422	6,472,974	4,077,714	4,187	330,000	3,751,901	‡580,522
Maine Central	931	1,149,186	1,018,525	2,311,217	409,215	264,238	23,867	744,648	63,315	1,505,283	805,934	12,486	94,867	723,553	‡207,739
Michigan Central	1,746	3,881,854	1,884,828	6,287,259	833,068	828,908	172,881	2,303,064	102,473	4,240,389	2,046,870	4,196†	277,000	1,765,674	‡491,057
Missouri, Kansas & Texas	3,072	4,277,951	1,807,468	6,440,784	846,505	1,078,351	133,411	2,220,849	186,705	4,465,821	1,974,963	407	294,052	1,681,318	‡848,847
Nashville, Chatt. & St. Louis	1,230	1,795,862	711,271	2,689,129	350,805	506,179	103,121	972,144	70,948	2,003,197	685,932	1,581†	60,000	624,351	‡120,019
New York Central & Hudson River	3,588	11,906,080	8,431,834	22,558,984	3,033,513	3,654,891	532,941	7,886,594	511,869	15,619,809	6,939,175	31,145	936,206	6,034,114	‡1,433,564
New York, Chicago & St. Louis	553	1,707,729	415,238	2,197,571	259,734	236,867	133,449	838,497	38,247	1,506,794	690,777	1,063†	84,000	605,714	‡17,029
New York, New Haven & Hartford	2,004	6,302,515	6,301,914	13,749,187	1,752,662	1,499,436	70,834	5,456,431	259,407	9,038,770	4,710,417	331,454	840,435	4,201,436	‡665,700
Oregon R.R. & Nav. Co.	1,264	2,502,360	984,706	3,677,304	410,970	212,253	61,056	894,802	83,412	1,662,493	2,014,811	5,399	126,510	1,893,700	322,891
Oregon Short Line	1,456	2,996,370	1,134,903	4,428,526	625,838	372,159	56,406	794,406	84,836	1,933,645	2,494,881	3,253	144,250	2,353,885	51,946
Pere Marquette	2,354	2,148,441	1,107,428	3,527,250	440,085	529,215	84,394	1,326,295	85,042	2,465,031	1,062,219	10,847	157,023	916,042	17,659
St. Louis & San Francisco	4,727	5,690,767	2,453,639	8,824,983	1,403,846	1,185,529	179,849	3,013,155	273,151	6,055,526	2,769,457	.....	331,522	2,437,935	‡241,913
San Antonio & Aransas Pass.	727	725,343	239,568	1,015,295	138,463	100,828	11,493	351,179	25,562	627,525	387,770	.....	27,700	360,070	20,396
San Pedro, Los Angeles & Salt Lake	1,099	939,275	613,292	1,654,859	294,573	209,340	69,897	550,542	47,449	1,171,802	483,057	4,024†	66,732	412,301	113,611
Seaboard Air Line	2,611	2,355,361	801,197	3,503,829	541,404	560,035	128,662	1,274,145	135,474	2,639,720	864,109	3,124†	151,500	709,485	‡13,018
Texas & Pacific	1,885	2,097,691	940,128	3,230,816	421,038	512,821	43,540	1,293,372	97,898	2,368,670	862,146	4,786†	242,016	615,344	‡255,118
Union Pacific	3,301	8,899,502	2,816,167	12,626,766	1,484,438	1,142,994	238,248	2,599,924	257,253	5,722,857	6,903,909	5,485	322,987	6,586,407	1,906,264
Wabash	2,515	4,310,111	1,956,724	6,774,862	722,995	929,037	203,798	2,410,710	182,815	4,449,355	2,325,507	532	208,602	2,117,437	‡337,505
Yazoo & Mississippi Valley	1,371	1,251,276	508,331	1,884,267	607,291	419,066	50,046	896,097	67,895	2,040,395	156,128*	9,613	103,770	250,285†	‡316,356

*Deficit. †Loss. ‡Decrease.

Crop Yields in 1908.

The crop reporting board of the United States Department of Agriculture finds that the preliminary estimate of the average yield per acre of corn is 26.2 bushels, which compares with 25.9, the final estimate in 1907, and 25.6 the average of the past 10 years. The indicated total production of corn is 2,642,687,000 bushels, as compared with 2,592,320,000, the final estimate in 1907. The quality is 86.9, compared with 82.8 in 1907, and 84.3 the 10-year average. Comparisons for important corn states follow:

(All 1908 figures are preliminary.)

States.	Yield per acre—Bushels			Total production (000s omitted)—Bushels		Quality. per cent	
	1908.	1907.	10-yr. av'ge.	1908.	1907.	1908.	1907
Illinois	31.6	36.0	34.4	294,860	342,756	90	86
Iowa	31.7	29.5	32.5	287,456	270,220	87	78
Missouri	27.0	31.0	28.5	203,634	241,025	80	88
Nebraska	27.0	24.0	27.1	205,767	179,328	88	84
Indiana	30.3	36.0	35.1	137,835	168,840	90	82
Texas	25.7	21.0	19.2	201,848	155,589	87	82
Kansas	22.0	22.1	22.5	152,900	155,142	83	83
Ohio	38.5	34.6	35.1	130,900	117,640	93	78
Oklahoma	24.8	24.4	25.2	122,239	113,265	81	80
Kentucky	25.2	28.2	26.5	84,823	93,060	84	88
Tennessee	24.8	26.0	22.9	74,747	78,364	88	88
Georgia	12.5	13.0	10.8	56,438	57,538	89	92
Michigan	31.8	30.1	31.9	60,420	57,190	90	74
South Dakota	29.7	25.5	26.7	57,677	47,175	91	81
Wisconsin	33.7	32.0	33.5	49,674	46,688	84	76
Virginia	26.0	25.0	22.0	48,828	46,025	89	90
Pennsylvania	39.5	32.5	34.2	55,814	45,922	91	75
Alabama	14.7	15.5	13.3	44,835	45,896	88	86
North Carolina	18.0	16.5	14.0	50,166	45,078	86	90
Minnesota	29.0	27.0	29.5	46,835	43,605	83	70
Arkansas	20.2	17.2	18.9	52,540	43,430	82	71
All other	21.8	20.3	18.7	222,451	198,544	88	83
United States	26.2	25.9	25.6	2,642,687	2,592,320	86.9	82.8
Divisions.							
North Atlantic	39.3	31.3	33.3	97,862	77,957	92.3	76.2
South Atlantic	18.2	17.7	15.1	245,200	234,249	88.5	88.9
N. Central East.*	32.6	35.0	34.4	673,689	733,114	90.1	82.2
N. Central West.*	27.5	26.8	28.0	958,125	939,575	85.1	82.3
South Central	22.6	21.5	20.3	660,775	600,104	85.0	82.9
Far Western	25.0	27.5	23.8	7,036	7,321	85.8	88.9

*Of the Mississippi River.

About 2.7 per cent. (71,124,000 bushels) of the corn crop of 1907 is estimated to have been in the hands of farmers on November 1, as compared with 4.5 per cent. (130,995,000 bushels) of the 1906 crop on November 1, 1907, and 4.5 per cent., the average of similar estimates for the past 10 years.

The preliminary estimate of the average yield of buckwheat is 19.8 bushels, as compared with 17.9, the final estimate in 1907; 18.6 in 1906, and 17.8 a 10-year average. A total production of 15,648,000 bushels is thus indicated, as compared with 14,290,000 in 1907. The quality is 90.7 per cent., against 87.3 last year and 89.9 the 10-year average.

The preliminary estimate of average yield per acre of potatoes is 85.9 bushels, as compared with 95.4, the final estimate in 1907; 102.2 in 1906, and 88.6 the 10-year average. A total production of 274,660,000 bushels is thus indicated, as compared with 297,942,000 in 1907. The quality is 87.6 per cent. against 88.3 last year and 87.6 a 10-year average.

The preliminary estimate of the average yield per acre of tobacco is 825.2 lbs., as compared with the final estimate of 850.5 lbs. in 1907, 857.2 in 1906, and a 10-year average of 797.6 lbs. A total production of 629,634,000 is thus indicated, as compared with 698,126,000 lbs. finally estimated in 1907. The average as to quality is 87.9 per cent. against 90.0 one year ago, 84.5 in 1906, and a 10-year average of 85.8

The preliminary estimate of the average yield per acre of rice (rough) is 34.7 bushels, as compared with 29.9 bushels finally estimated in 1907, 31.1 bushels in 1906, and a 10-year average of 30.6. A total production of 22,718,000 bushels is thus indicated, as compared with 18,738,000 bushels in 1907.

Massachusetts Express Rates Declared Excessive.

The Railroad Commissioners of Massachusetts find that the existing rates of the American and National express companies are excessive and unreasonable. The complainants were the Merchants' Association and others, and in rendering the decision the commissioners say:

"We are well aware of the difficulties that attach to an attempt to make an exact mathematical computation of the cost of an intrastate service intermingled with an interstate one, but we regret that the information disclosed by the respondents' evidence has been meager, and to a large extent unsatisfactory. Their method of undertaking to demonstrate the cost of service by expert opinions based upon a theory of percentages has afforded us little insight into the real and essential aspects of their financial affairs.

"This theory of percentages is, in our opinion, fallacious and unconvincing. We agree that the cost of doing the business of the respondents has increased in common with the cost of transacting other branches of commerce and industry, but we find nothing in the evidence tending to confirm the opinion of the general traffic manager that the intrastate business shares an undue proportion of the operating expenses, or that the territory within 50 miles of Boston has borne an undue share of the burden of transacting express business in this commonwealth.

"In short, voluntary action of the respondents in maintaining for years a rate for domestic business within the 'Boston contiguous territory' presents an evidentiary fact which not only tends to establish the reasonableness of the rates so maintained, but speaks with more conviction to our minds than the opinion of the officials of the respondents, who now contend that their intrastate business cannot be performed at rates lower than those established in February of this year and yield to them the just and fair return to which they are entitled for service rendered.

"No longer ago than Jan. 1, 1908, when the respondents' rates within the New England territory were sharply advanced, a 15-cent minimum rate in the 'Boston contiguous territory' was re-established. We cannot believe that this action of the company was taken without consideration or upon other factors than deliberation and experience, and yet within 40 days of its installation it was summarily withdrawn and the rates now in existence established.

"If it be contended by the respondents that their rates have always been made in competition, it can be no answer for them now to withdraw them when the competition is in so large a measure eliminated. To recognize this argument is to outrage every principle of fairness and justice upon which rates between the public and the companies are to be ascertained.

"Neither is it an answer for the respondents to urge that substantially 40 per cent. of the public's contributions in the way of increased rates goes to the railroads and not to them. Whatever the application of the increased charges, the public is still the contributor.

"In determining what these respondents are to be fairly allowed for the public service which they perform, which determination must be made without reference to their interstate business, and applying the rule of proof which we have adopted, the board has no hesitancy in declaring that it ought not, on the evidence before it, to approve the rates now in force in the territory within which our investigation has been made.

"We recognize the subject as new, and that we should proceed with caution. It may well be that when a complete disclosure of the interstate business of the respondents in this commonwealth has been made to the board, conditions not now before it may suggest a readjustment of the express rates in Massachusetts.

"Pending that time, we are of opinion and decide that the existing rates of the respondents in force between Boston and the cities and towns in this commonwealth situated at a distance not greater than 50 miles as established and maintained under scale No. 39, issued Jan. 6, 1908, are excessive and unreasonable."

Advice to Shippers Concerning Freight Claims.

The Freight Claim Committee of the National Industrial Traffic League has issued a circular to its members, the recommendations in which, if followed by shippers, would largely reduce the number of claims for loss and damage to freight and facilitate the satisfactory settlement of such claims. The circular says:

"Frequently delay in settlement of claims has been due to errors in the preparation of them by the claimants. The railroads are obliged to be much more careful than heretofore in the investigation and settlement of all claims. The

days of 'policy settlements' are absolutely at an end, and all freight claims, particularly those for so-called 'concealed loss,' are scrutinized with the greatest possible care. The Interstate Commerce Commission is keeping a particularly close watch upon the matter of freight claims, insisting that no claims whatever shall be paid unless and until there is absolutely clear evidence of liability shown, and the Commission is regarding with extreme disfavor the settlement of claims for 'concealed loss and damage' as tending, in the opinion of the Commission, to open the door to rebating. This renders necessary the use of special care in preparing and presenting claims for loss and damage and for overcharge.

"Claims for overcharge can largely be avoided by a careful examination of freight bills before payment. It is just as much a violation of the law for railroads to charge more than the legal rate as to charge less than the legal rate. Where freight bills are presented showing incorrect rating, consignees should decline to pay and insist upon the legal rate being applied.

"Goods should be carefully examined before taking them from the railroad. In cases of damage the fact should be noted on the receipt, and the railroad agent should be requested to make notation of the damage on the expense bill, or to sign an exception sheet setting forth the damage. If the damage is discovered after having given the receipt and before taking property from the possession of the railroad, drayman should insist upon endorsing the fact of the damage upon his receipt; and if not permitted to do so, should report facts to the consignee, who should then give written notice of the damage to the railroad agent.

"Where the damage cannot be discovered until cases are opened immediate notice should be given to the railroad agent and he should be requested to send someone to inspect the goods. Should the railroad agent refuse to send an inspector, consignee should then promptly advise him in writing as to the nature and extent of the damage, notify him that claims will be presented for same, and at the same time have the damaged condition of the shipment certified to by a witness.

"Claims for overcharge should be accompanied by the original bill of lading and original paid freight bill, and where rate is not named in the bill of lading should give tariff authority for rate claimed.

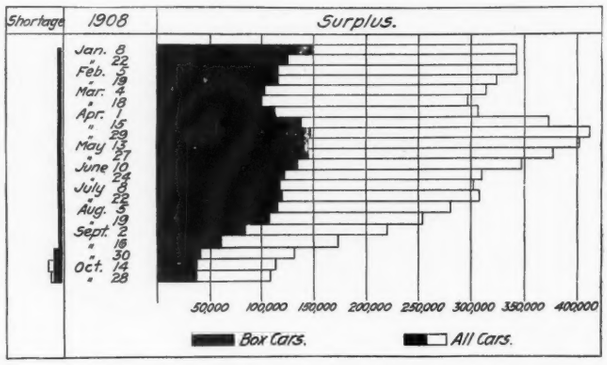
"Claims for loss and damage should be accompanied by the original bill of lading and original paid freight bill; also by either the original invoice or a properly certified copy thereof.

"There are constantly increasing complaints from the railroads regarding the use of boxes and crates for packing of goods which are not strong enough. It is to the interest of the shipper as well as of the carrier that all goods be securely packed so as to be able to withstand the ordinary risks of transportation.

"While it is undoubtedly true that the large increase in the volume of damage claims during the past 10 years has been, in a great measure, due to the increase of car capacity, use of automatic brakes and couplers and increase of train loads, it is also true that the efforts of shippers to economize in expense of packages has led to the use of insufficient and improper packages. When we criticize the railroads for rough handling of shipments, we must at the same time keep our own skirts clear by the use of such methods in packing and such character of packages as will clearly withstand the ordinary risks of transportation."

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 33-A, giving a summary of surpluses and shortages by groups from October 30, 1907, to October 28, 1908, says: "The total surplus available cars on the date of this report was 110,912, a decrease of only 4,124 since the last report. The shop cars, however, show a decrease of 14,000, making a net improvement of about 18,000 cars."



Car Surpluses and Shortages in 1908.

The accompanying table shows the car surpluses and shortages for the period covered by the report, and the accompanying diagram shows surpluses and shortages for 1908.

CAR SURPLUSES AND SHORTAGES, FROM OCTOBER 30, 1907, TO OCTOBER 28, 1908, INCLUSIVE.

	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
October 14, 1908	163	38,878	9,682	37,556	28,920	115,036	8,544	895	3,335	425	13,199
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,388	48,292	342,580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724
November 27, 1907	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	2,224	17,964
October 30, 1907	161	786	600	1,285	1,275	3,946	61,592	3,546	15,987	9,622	90,757

Injunction in Missouri River Jobbers' Case.

The United States Circuit Court, at Chicago, Judges Grosscup, Seaman and Baker, on November 6 issued an injunction restraining the Interstate Commerce Commission from enforcing its order in the Missouri River Jobbers' case (Burnham, Hanna, Munger et al. v. C., R. I. & P. et al.). The Commission's order required the railroads running from the Mississippi to the Missouri river to make proportional class rates on shipments originating at the Atlantic seaboard about 15 per cent. lower than the local rates on goods moving from the Mississippi to the Missouri. Judge Grosscup in rendering the opinion of the court, which was concurred in by Judges Seaman and Baker, said in part:

"There is only one feature of this bill that the court wishes to speak of, at this time, and that is the feature that grows out of the fact that under the order of the Commission a rate of nine cents less is given, on first-class matter, and correspondingly on other matter, to traffic originating on the Atlantic seaboard, over traffic originating intermediately, between the Atlantic seaboard and the Mississippi river.

"The bill alleges that that is discriminatory, and cites the attention of the court to the opinion of the Commission, in which the Commission frankly and clearly avows that that differential of nine cents on first-class and correspondingly on other classes, is necessary to preserve to the Missouri river cities the advantage that they are expected to obtain from the reduction put in force; that, to make that reduction universal, instead of in the way of a differential, would be to

put the cities east of the Mississippi river upon the same standing relatively as the Missouri river cities. * * *

"There is no doubt but that, in the case brought to our attention in this bill, there is discrimination; but is that undue or unreasonable, within meaning of the Act? Whether it be undue or unreasonable depends upon so many considerations that there is no one test that applies to it. As between individuals living in the same locality, and engaged in the same kind of traffic, and especially, or particularly, unless one has wholesale traffic and the other has a retail traffic, there would be discrimination, undue and unreasonable discrimination, if there was any discrimination. But, between localities, as, for instance, St. Paul or Minneapolis on the one hand and the Missouri river cities on another, there might not be undue or unreasonable discrimination because of the accessory fact that St. Paul and Minneapolis had a competitive line, by way of the Great Lakes. That is only illustrative of the elements or considerations that enter into the inquiry of what is undue and what is unreasonable.

"We think that sufficient has been shown in this bill to require us to grant the interlocutory order. In the first place, there has grown up in this country, on the basis of the old rates, the commerce of the country. We cannot overlook that fact. We must take notice of that fact. It is altogether probable, as a part of that fact, that trade houses in this intermediate country have grown up upon the condition that they are given the same relative rates to the western country that the Atlantic coast cities are given to the western country. Then, in addition to that, there is this expression, this express avowal upon the part of the Commission, of the purpose, which shows that there must have been something in the mind of the Commission, some discussion before the Commission, as to what the effect of that differential would be, and the advantage that the Missouri river cities would get by reason of the differential. And, in the hearing, the proposed order was opposed by the chambers of commerce and boards of trade of the cities east of the Missouri river prejudicially affected.

"At any rate, it disturbs commercial conditions that have grown up through a long line of years upon the basis of the present rates; and we think that is sufficient to require us to restrain its going into effect until the facts come in, that we may determine upon the basis of the facts."

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Nashville, Chattanooga & St. Louis, as reported in the *Railroad Age Gazette* of October 16, has ordered three 10-wheel, compound locomotives from the Baldwin Locomotive Works for December delivery. The specifications are as follows:

General Dimensions.

Weight on drivers	134,000 lbs.
Total weight	181,400 "
Cylinders	16 in. and 27 in. x 26 in.
Diameter of drivers	66 "
Boiler, type	Extended wagon top
Boiler, working steam pressure	210 lbs.
Heating surface, tubes	2,551 sq. ft.
" " firebox	185 "
" " total	2,736 "
Tubes, number	256
" outside diameter	2¼ in.
" length	17 ft.
" material	Charcoal iron
Firebox, type	Narrow
" length	120 in.
" width	41⅞ "
" material	Steel
Grate area	34.86 sq. ft.
Tank capacity	5,500 gals.
Coal capacity	10½ tons

Special Equipment.

Bell ringer	Simplicity
Boiler lagging	Sectional magnesia
Brakes	Westinghouse
Brake-beams	Chicago Railway Equipment Co.
Couplers	Am. Steel Foundries & Nat. Mall. Castings Co.
Headlight	Pyle-National
Injector	Nathan Manufacturing Co.
Piston and valve-rod packings	Holmes
Safety valves	Coale
Sanding devices	American
Staying	Flannery Bolt Co.
Steam gages	American Steam Gage Co.
Steam heat equipment	Gold Car Heating Co.
Tires	Standard Steel Works
Valve gear	Walschaerts
Wheel centers	Cast steel

The Western Maryland is asking prices on three passenger locomotives.

The Roumanian Government Railways, reported in the *Railroad Age Gazette* of October 9 as being in the market for 21 locomotives, has not yet placed this order.

The Panama Railroad, reported in the *Railroad Age Gazette* of October 30 as receiving bids for twelve 5-ft. gage, oil-burning, mogul locomotives, has ordered this equipment from the American Locomotive Co.

CAR BUILDING.

The Seattle Electric Co., Seattle, Wash., has ordered 100 city cars from the St. Louis Car Co.

H. A. Clark & Co., 17 State street, New York, are asking prices on 20 second-hand Rodger ballast cars.

The Grand Trunk is said to have ordered 1,000 steel cars from the Pressed Steel Car Co. This item is not confirmed.

The Ardmore Traction Co., Ardmore, Okla., has ordered four city, 21-ft., semi-convertible cars from the St. Louis Car Co.

The Carolina, Clinchfield & Ohio is said to have ordered 2,250 steel gondola cars from the Pressed Steel Car Co. This item is not confirmed.

The Texas Traction Co., Dallas, Tex., has ordered 12 combination express and baggage cars and one special designed work car from the St. Louis Car Co.

The Northern Pacific, reported in the *Railroad Age Gazette* of November 6 as asking prices on equipment, has ordered 350 Hart convertible ballast cars from the Rodger Ballast Car Co.

The Western Maryland is asking prices on 300 steel underframe box cars, 300 steel underframe gondolas and 10 caboose cars in addition to the 500 steel hopper bottom cars reported in the *Railroad Age Gazette* of October 30.

The Pennsylvania, reported in the *Railroad Age Gazette* of October 9 as asking prices on steel coaches and a number of postal cars, has ordered 77 steel passenger cars from three builders. The Pressed Steel Car Co. received an order for 31 of the cars, divided as follows: Twenty-four 70-ft. combination passenger and baggage; four 60-ft. baggage and three 70-ft. combination baggage and mail cars. The American Car & Foundry Co. received an order for 29 cars, divided as follows: Twenty-three 70-ft. passenger and six 60-ft. baggage cars. The Standard Steel Car Co. received an order for seventeen 70-ft. passenger cars.

IRON AND STEEL.

The Chicago & North-Western will soon be in the market for 32,000 tons of rails.

The Atlantic Coast Line has ordered 25,000 tons of rails from the Pennsylvania Steel Co.

The Atchison, Topeka & Santa Fe has ordered 5,000 tons of bridge and girder steel from the American Bridge Co.

The Montreal & Southern Counties has given the United States Steel Corporation a contract for rails for the 16 miles of road now under construction.

The Australian Government is said to have given a contract for 16,000 tons of rails to the Dominion Iron & Steel Co. It is said that these are the first rails ever shipped from Canada to Australia.

The Chicago & North-Western, for its new terminal building in Chicago, will have 4,100 tons of structural steel fabricated by the American Bridge Co. This, with the 24,000 tons recently awarded this company for the approaches, makes a total of 28,100 tons to be supplied by this company.

RAILROAD STRUCTURES.

AMARILLO, TEX.—The Pecos & Northern, a subsidiary of the Atchison, Topeka & Santa Fe, has awarded the contract for the erection of shops to replace those recently burned. The

work includes new shop, 12-stall roundhouse, 300-ton coal chute and standard mechanical sandhouse. The structures will be of brick and steel construction and cost $50,000. (Oct. 30, p. 1266.)

Ft. William, Ont.—The Grand Trunk Pacific, it is said, has given a contract to James Stewart & Co., of Chicago, for building a $1,500,000 grain elevator.

Galveston, Tex.—Plans for the new bridge and causeway across the Galveston bay have not yet been prepared, but in general it is proposed to build a swing drawbridge about 280 ft. long and 44 ft. wide, to provide a 100-ft. clear water way for vessels. Two steam railroad tracks will occupy 27 ft. of this width and 17 ft. will be used jointly by an interurban line and the county as a highway. On each end of this drawbridge a reinforced concrete arch bridge, about 950 ft. long, will be built. The arches will probably have a span of about 50 ft. and will be 65 ft. wide. Of this width, 29 ft. is for the steam railroad tracks, 15 ft. for the interurban line, and 21 ft. for the county highway and city water main. The balance of the construction, about 4,000 ft. to the shore line on either side of the arch bridge, is to be an embankment, protected at the toes with a reinforced concrete bulk-head and rip-rap, the slopes to be protected by paving. The top width of this embankment is to be 100 ft., 50 ft. of which is to be used by the steam railroad, 27 ft. by the interurban line and 23 ft. by the county. The height of the rails above mean low tide will be about 17 ft. Preliminary borings for the bridge foundations will be made this month and immediately thereafter it is expected to prepare plans and specifications. The contract between the county, railroad and interurban line is about completed and in general contemplates that the county shall build and lease to the several users the improvement for 999 years. The portion indicated for the steam roads is to be leased at 50 per cent. of the cost and to the interurban road at 25 per cent. The approximate estimated cost of the entire work, exclusive of the shore approaches, railroad tracks and signals, is $1,400,000. (July 31, p. 64.)

Grand Rapids, Wis.—The Green Bay & Western will build a freight depot and warehouse here.

Hayward, Cal.—See Oakland, Cal.

Leesville, La.—The Kansas City Southern, according to a press despatch from Leesville, will in the near future begin the erection of a brick roundhouse and car repair shop.

Livermore, Cal.—See Oakland, Cal.

Marysville, Cal.—See Oakland, Cal.

New Orleans, La.—Press reports say that the Texas & Pacific will build a new passenger station here. Negotiations are now pending with the Progressive Union committee which has the matter of securing a new station in hand.

The freight sheds and 11 box cars of the Illinois Central were destroyed by fire recently, with a loss of about $75,000.

New York.—Bids are asked until November 19 for furnishing lumber, steel and hardware for maintenance of Harlem river bridges during 1909. J. W. Stevenson, Commissioner of Bridges.

Oakland, Cal.—The Western Pacific has awarded contracts for the erection of new passenger stations at Livermore, Cal., and Hayward. The stations will cost $10,000 each and are to be completed about February 1. They will be of the Mission type, 42 ft. x 81 ft., of solid concrete, with a superstructure of plaster on metal lath. Plans are now being completed for passenger stations to be built at Oakland, Sacramento, Marysville and Stockton, all to be of the mission type. (Oct. 23, p. 1218.)

Oil City, La.—An officer of the Kansas City Southern writes that the reports regarding plans and specification for a combined freight and passenger station refer only to a small frame building which will be moved from another place where it is no longer needed.

Paris, Ky.—The Louisville & Nashville has plans made for the construction of machine shops, roundhouse, passenger station and laying 16 new tracks at Paris. The improvements are to cost about $250,000.

Portland, Ore.—See Spokane, Portland & Seattle under Railroad Construction.

Prince Rupert, B. C.—The estimated cost of a bridge to be built by the Grand Trunk Pacific, to connect Kaien Island with the main land, is about $1,000,000.

Sacramento, Cal.—See Oakland, Cal.

St. Paul, Minn.—The St. Paul Bridge & Terminal Railway will put up a steel bridge with pile trestle approaches over the Mississippi river. (See this company under Railroad Construction.)

San Antonio, Tex.—Bids for the new Galveston, Harrisburg & San Antonio (Southern Pacific) freight house, it is said, are in the hands of the railroad company. It is expected that the contract will be let shortly and work started at once. (Oct. 23, p. 1218.)

Saskatoon, Sask.—Bids are being considered for the construction of new freight sheds and offices and it is hoped to have the building ready for occupation by the end of the year. The building will be 40 ft. x 240 ft.

Stephenville, Tex.—It is said that the Fort Worth & Rio Grande (St. Louis & Francisco) has selected the site for a brick passenger station.

Stockton, Cal.—See Oakland, Cal.

White Springs, Fla.—The Suwannee River Railway & Power Co., D. G. Zeigler & Co., Jacksonville, Fla., will build a power station, bids for which will be received within 60 days.

SIGNALING.

The Chicago, Rock Island & Pacific is said to be in the market for the necessary material to equip 500 miles of single-track line with automatic block signals.

The St. Louis & San Francisco has let to the Union Switch & Signal Co., Swissvale, Pa., the contract for automatic block signals for 712 miles of single-track line. The signal company is to furnish the material and install the signals. The signals will be style B, three-position, lower quadrant.

The Baltimore & Ohio has published a record of the performance of automatic block signals on that road for seven years and six months, showing an increased number of signals each year since 1904, and an increasing percentage of efficiency. The record is as follows:

Year.	No. of signals.	Perfect signal movements.	Failures.	Signal movements per failure.	Per cent. of failure.	Per cent. of efficiency.
1901....	115	686,187	434	1,581	0.32	99.68
1902....	337	4,495,318	1,075	4,460	.11	99.89
1903....	308	5,604,875	1,154	4,856	.10	99.90
1904....	239	6,170,208	1,014	6,085	.09	99.91
1905....	247	7,237,797	682	10,612	.08	99.92
1906....	308	9,011,758	651	13,843	.04	99.96
1907....	388	10,657,912	598	17,852	.04	99.96
1908*...	478	5,983,619	281	21,294	.02	99.98

*Six months.

These percentages are obtained by taking the number of actual failures multiplied by the number of trains stopped by such failures, which total being divided by the number of perfect movements, gives the result. The division between dangerous and non-dangerous failures is not shown.

Normal Danger Patent Decision.

Judge Hazel, in the Circuit Court of the United States for the Western district of New York, has just decided in favor of The Hall Signal Company a suit for infringement of the Hall Company's normal danger patent No. 470,813, and has directed the entry of a decree for a perpetual injunction and for an accounting of damages and profits. In 1906 The General Railway Signal Company installed on the Illinois Central Railroad a normal danger system of automatic home and distant block signals on a few miles of track, making a foundation for a suit. Judge Hazel says:

"This then is a case where the inventor is shown to have taken the last step which accomplished the desired result and in consequence he became a pioneer in the art of normal danger signaling. He solved the problem in a simple enough

way, but where others tried and successively failed he succeeded, and his endeavors therefore in the field of railroad signaling most puissantly point to invention entitling his claim to a broad construction." On the subject of infringement Judge Hazel says: "The defendant has appropriated the invention owned by the complainant and the installations complained of in the bill were infringements of claim one."

SUPPLY TRADE NOTES.

The New York office of the Darley Engineering Company has been moved to the Singer building, 149 Broadway.

The Florence Machine & Railroad Supply Co., Florence, Ala., will build a 40-ft. x 80-ft. addition to its plant. The structure will cost $3,000.

James K. Kelly, who for 25 years was in charge of the motive power department of the Illinois Steel Co., Chicago, died on October 6 at his home in Chicago.

The date for opening bids on three rapid unloading cranes, Isthmian Canal Commission, Circular No. 475, has been postponed from November 16 to November 24.

The Railway Steel-Spring Co., New York, recently ordered, from the Arthur Koppel Co., Pittsburgh, Pa., 50 storage battery cars of 15 tons capacity for use at its Latrobe works.

The fifth annual convention of the Northwestern Cement Products Association will be held in Minneapolis, Minn., on March 2, 3 and 4, 1909. J. C. Van Doorn, Secretary, Minneapolis.

The Fayette Lumber Co., Connellsville, Pa., recently installed a double trolley five-ton special crane, electrically operated, designed and built by the Northern Engineering Works, Detroit, Mich.

G. R. Folds, General Manager of the West Penn Railways, has resigned to become General Sales Agent and Assistant to the President of the H. W. Johns-Manville Co., New York. His office will be in New York.

W. G. Brown has resigned as Vice-President and General Manager of the Ewing-Merkle Electric Co., St. Louis, to take a position with the Continuous Rail & Safety Switch Co., Security Syndicate building, St. Louis, Mo.

The Asbestos Protected Metal Co., Canton, Mass., has recently filled orders for material to be applied on structures along the right of way of the Atlantic Coast Line at Jacksonville, Fla., Lakeland, Sanford and Florence, S. C.

The Western Steel Car & Foundry Co., Chicago, has bought 36 acres on the east side of the Calumet river, extending from 134th street to 136th street, Hegewisch, Ill., adjacent to the company's present plant. No additional improvements are contemplated immediately.

Robert B. Fuller, for some time past representative in the West of the Carborundum Company, Niagara Falls, N. Y., has been made Manager of the New York office of the company, 136 Liberty street. Mr. Fuller will give special attention to the railroad department of the company.

The Light Inspection Car Co., Hagerstown, Ind., recently installed a triple-cylinder, 85-h.p. gas engine and is now supplying the different departments with power by electric motors. This company has almost doubled its capacity in the last 18 months and is at present running the entire factory overtime.

The Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., has taken over the sale and manufacture of the Wolff truck side frame, which has heretofore been handled by the Wolff Truck Frame Co., Chicago. Inquiries concerning the Wolff truck side frame will be attended to by any of the offices of the Scullin-Gallagher company.

The West Pascagoula Creosoting Works, West Pascagoula, Miss., is at present filling a number of orders for creosoted piles and trestle lumber for the Louisville & Nashville, and an order for creosoted lumber for the Panama Railroad. It recently received a contract from the War Department for 20 carloads of creosoted sheet piling, to be used at Fort McRee, near Pensacola, Fla.

The W. K. Kenly Co., Chicago, has been appointed the Western Representative for the Kalamazoo Railway Supply Co., Kalamazoo, Mich., and will have exclusive representation in the following cities: Chicago, St. Louis, Kansas City, St. Paul, Minneapolis, Duluth and Milwaukee. A full stock of velocipedes, hand cars, push cars and track tools will be carried by the Kenly company in its warehouse at Chicago.

E. E. Silk has gone to the Bettendorf Axle Co., Davenport, Iowa, as representative, with headquarters at the Chicago office, 1170 Old Colony building. Mr. Silk, who is a graduate of Purdue University, was at one time in the mechanical department of the Central Railroad of New Jersey and later Associate Editor of the *American Engineer and Railroad Journal*. Since then he has been in the railroad supply business, both in New York and Chicago, and has a wide acquaintance in the railroad field.

The International Car Co., New Orleans, La., has purchased 37 acres of land adjoining the Belt Railroad at New Orleans, upon which it will build a new plant for repairing and rebuilding freight cars, coaches, locomotives and other railroad and industrial equipment. The plans for the new plant have been approved and construction work will begin soon. Bids are being asked for the machinery and building requirements by A. T. LeBaron, Vice-President and General Manager, 1029 Maison Blanche, New Orleans. It is expected the plant will be in operation by January 1.

S. F. Bowser & Co., Fort Wayne, Ind., say that October was the best month in their history, both in the amount of business received and in the amount of shipments. There is a very marked improvement in the inquiries received from railroads and the prospects are looking brighter all the time. Work is being rushed on a new building to be used as an engineering department and sample room; also on a new railroad running from the Pennsylvania tracks to the factory, a distance of a little over a mile. They expect to complete both of these improvements within the next 30 days.

The Bethlehem Steel Company, South Bethlehem, Pa., has made certain changes in its organization. The new personnel is as follows: C. M. Schwab, President; A. Johnston, First Vice-President; H. S. Snyder, Second Vice-President; E. G. Grace, General Manager; C. A. Buck, General Superintendent; J. F. Meigs, Engineer of Ordnance; B. H. Jones, Secretary and Treasurer; James Kernan, Assistant Secretary and Assistant Treasurer; A. D. Mixsell, General Sales Agent; F. A. Shick, Auditor; R. S. Van Horn, Purchasing Agent; T. O. Cole, Traffic Manager; J. D. Hagenbuch, Assistant to General Manager; J. H. Ward, Secretary to President.

C. H. Spotts, for some years in charge of the Paint Department of the Joseph Dixon Crucible Co., Jersey City, N. J., has been appointed Secretary of The Protectus Company, North American building, Philadelphia, Pa. The company has opened an office at 30 Church street, New York, in charge of W. F. Swearer, New York Manager; over this office Mr. Spotts will have direct jurisdiction. Mr. Spotts, in his capacity as Manager of the Paint Department of the Joseph Dixon company, had much to do with railroads. His principal work for The Protectus Company will be to extend the use of Protectus paints among both steam and electric roads. The company makes preservatives for metal and wood, marine compositions and insulating paints.

TRADE PUBLICATIONS.

Drills.—The Niles-Bement-Pond Co., New York, has just issued a 9-in. x 12-in. catalogue on drills, describing and illustrating multiple spindle, gang, sensitive and bench drills.

Feed Boxes and Water Troughs.—The Kilbourne & Jacobs Manufacturing Co., Columbus, Ohio, is mailing a leaflet which describes, among other things made by this company, metal feed boxes and water troughs for use in stock cars.

Steel Tapes, Etc.—The Chicago Steel Tape Co., Chicago, is mailing a pamphlet which should be of particular interest to engineers and surveyors as it contains descriptive matter and half-tone illustrations of steel tapes, leveling rods, targets, lining poles, etc.

Oxy-Acetylene Welding and Cutting.—The Davis-Bournonville Co., New York, has just issued a small pamphlet which contains copies of letters from a number of French engineers, telling of their experience in the use of the oxy-acetylene process of welding and cutting in connection with marine boilers.

Thermit.—The Goldschmidt Thermit Co., New York, has just issued a pamphlet containing information regarding the applications of thermit in foundry practice. The pamphlet also contains an extract of a report on the methods used to avoid piping in steel ingots in the Hungarian government steel foundries.

Bascule Bridges.—The Strauss Bascule and Concrete Bridge Co., Chicago, has just issued bulletin No. 1 on bascule bridges. This bulletin is supplementary to the regular catalogue and contains data, fac-similes of letters and reports, also half-tone illustrations of recently designed and completed types of bascule bridges.

Lathes.—A 9-in. x 12-in. loose leaf catalogue just issued by the Bridgeford Machine Tool Works, Rochester, N. Y., illustrates and describes engine and axle lathes made by this company, including the following sizes: 32 in., 36 in., 42 in. and 48 in. The cover of this catalogue is arranged to receive additional pages.

Friction Clutches.—The Carlyle-Johnson Machine Co., Hartford, Conn., has just issued catalogue D, which is larger than previous ones and contains considerable additional information in regard to driving machinery direct from line shafting through friction clutches, thus eliminating counter shafts, cross belting, etc.

Mine and Quarry.—The October issue of this periodical, published by the Sullivan Machinery Co., Chicago, contains an article by Geo. M. Crawford entitled "A New Departure in Mine Power Plants," being a description of the installation of the Cowanshannock Coal & Coke Co., at Yatesboro, Pa. A number of half-tone illustrations of mine interiors and construction work are given.

Jacks.—*Buda Jacks* is the title of catalogue No. 123 of the Buda Foundry & Manufacturing Co., Chicago, in which are described ball-bearing, cone-bearing, geared ratchet, ratchet and friction designs for railroad and industrial lifting purposes. The catalogue is 6 in. x 9 in., 84 pages, and contains good descriptive matter and well-arranged illustrations.

Steel Ties and Rail Joints.—An artistic catalogue issued by the Carnegie Steel Co., Pittsburgh, Pa., deals with steel cross ties and the Duquesne rail joint. A new design of rail clip is also illustrated. The catalogue contains a large number of reproductions of photographs of sections of track laid with steel cross ties. About half of the catalogue is devoted to concrete track construction, with a number of half-tone illustrations.

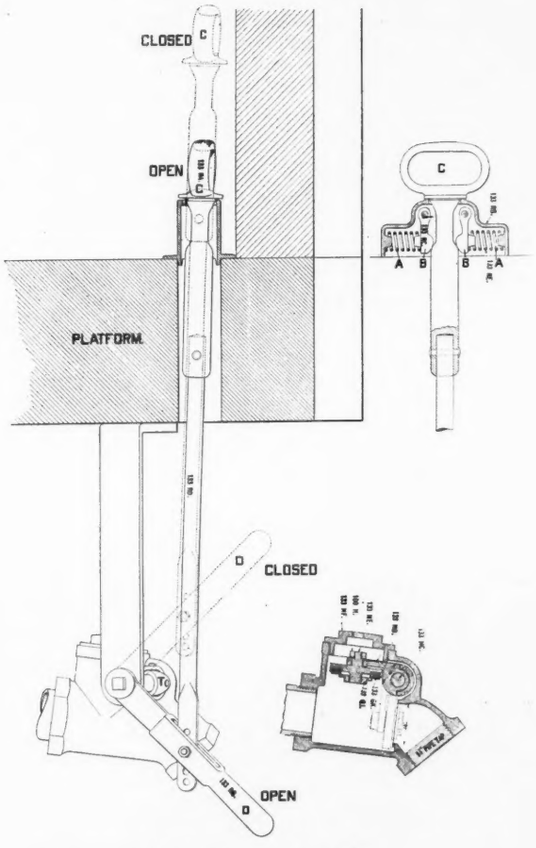
Track and Railroad Supplies.—General catalogue No. 20, 4¾ in. x 7⅛ in., issued by the Kalamazoo Railway Supply Co., Kalamazoo, Mich., contains a detailed description of the various track and railroad supplies made by this company. The publication has 144 pages and is bound in board covers. The first pages give a description, accompanied by illustrations and line drawings, of Moore track drills, their feed mechanism and operation. The hand cars, inspection cars, push cars, rail cars, velocipedes and motor cars, each designed to meet certain requirements and made in any gage desired, are fully described. Among the other supplies described are Kalamazoo jacks of various sizes and for special uses, track levels, track gages, rail benders, the Smith curve lining gage, pipe bending machine, locomotive and car replacers, Aldon frogs, steel and wood cattle guards, steel water tanks, geared pumping engine and the Root locomotive spring snow scraper. An index makes the contents of the catalogue easily accessible.

Southern and Southwestern Railroad Club.

The annual meeting of the Southern and Southwestern Railroad Club will be held at the Piedmont hotel, Atlanta, Ga., on November 19 at 10 o'clock a.m. Officers for the ensuing year will be elected. The subject for discussion will be "Headlights and Signals." The Secretary, A. J. Merrill, is arranging for a luncheon in connection with the meeting.

Train Pipe End Valve.

End valve No. 133N was designed by the Consolidated Car Heating Co., Albany, N. Y., to meet the demand for a quick opening end valve. To obtain the best results from a valve of this type, the port should not be obstructed in any way whatever, i.e., a valve with an absolutely free opening is far superior to one which has the same size opening but divided up by obstructions in the port. The cut shows the straight and unobstructed port obtained in this valve. When open, the gasket head is directly under the cap and tests made on the valve show that the skin friction to the flow of steam is no greater than in the train line itself. This becomes an important item in the operation of long trains. The head closes in the direction of steam pressure and, as it is held by a swivel, true alinement of the gasket is always assured. A groove is cut in the seat, which allows condensation to pass off and thus prevents freezing of the rear valve on a train. The valve is operated by what is claimed to be the simplest platform device ever placed on the market; and all that is necessary to operate the valve is to pull the handle up to close the valve and push it down to open it. The valve is held in each position by springs, as shown in the drawing. The valve can also be operated from the outside by a lever, as will be noted.



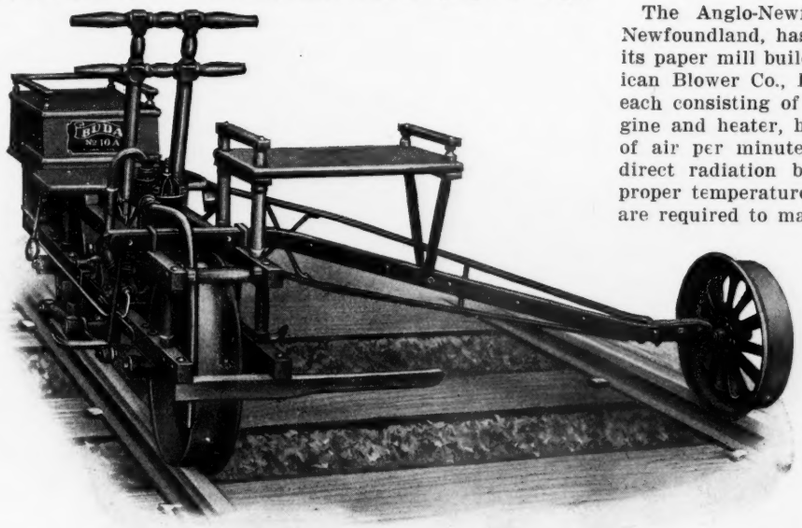
Train Pipe End Valve.

Concrete Ties in Italy.

The Italian State Railroads have ordered from the Gobellini Cement Co. 300,000 reinforced concrete ties. Several thousand were bought some years ago for experiment, and the design of those now ordered will be a modification of the earlier one.

Buda Railroad Motor Cars.

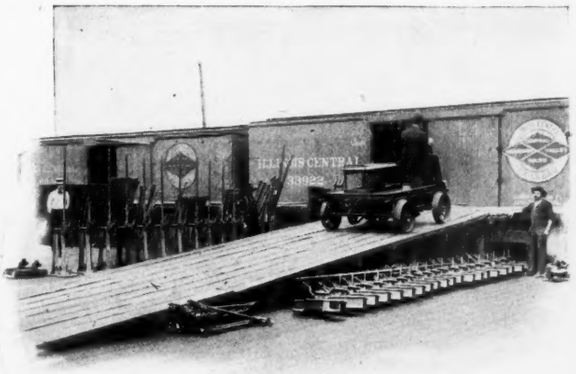
Buda motor velocipede No. 10, which was brought out last spring, has been described in these columns. A No. 10A car is now made, which is a duplicate of the No. 10, except that it has an extra seat. This seat is over the guide arm of the car, as shown by the illustration herewith, bringing the weight



Buda Motor Velocipede.

of the passenger over the middle of the track and keeping the guide wheel from any tendency to ride the rail. The person occupying the seat may, by facing about, help the operator pump the car with the hand lever.

A photograph of a Buda No. 14, 10 h.p. section motor car climbing a 7½ per cent. grade on the flanges of its wheels is also shown. The car traversed half the distance, was brought to a stop and then re-started. This was said not to



Buda Car Climbing Steep Grade.

have taxed the capacity of the engine; in fact, the engine has never been tested to the limit in this respect, the grade here shown being used because it happened to be available at the factory.

These cars are built by the Buda Foundry & Manufacturing Co., Chicago.

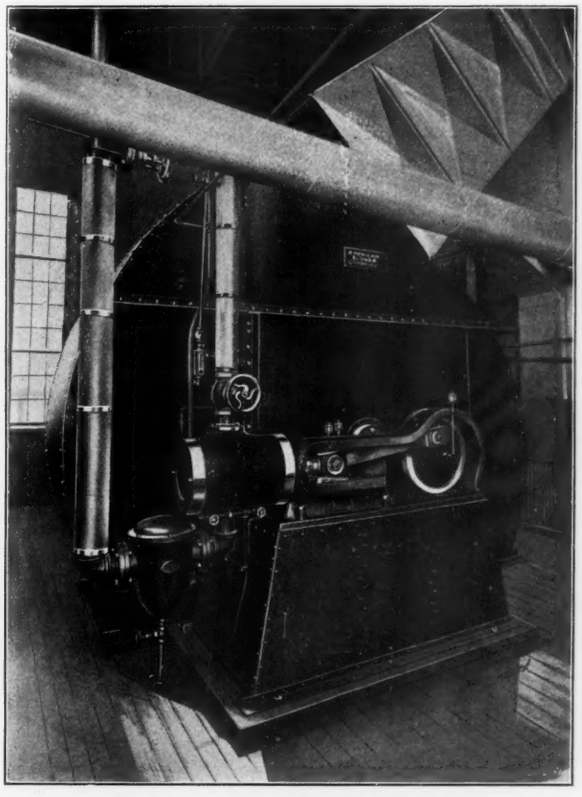
1909 M. M. and M. C. B. Conventions.

A meeting of the Executive Committees of the American Railway Master Mechanics' Association and the Master Car Builders' Association, to take action in the matter of a place for holding the 1909 conventions, will be held in room 8 on the sixth floor of the Engineering Societies building, 29 West Thirty-ninth street, New York, at 10 o'clock a.m., November 20, 1908. A meeting of the Executive Committee of the Railway Supply Manufacturers' Association, to decide certain matters that depend on the action of the executive committees of the railroad associations, will be held at the Hotel Belmont, New York, some time during the afternoon of the same day.

Heating Plant for Mill.

The Anglo-Newfoundland Development Co., Grand Falls, Newfoundland, has recently awarded the contract for heating its paper mill buildings, now under construction, to the American Blower Co., Detroit, Mich. The four sets of apparatus, each consisting of a steel plate fan, with direct-connected engine and heater, have a combined capacity of 267,000 cu. ft. of air per minute, a total of 13,827 sq. ft. of cast iron in direct radiation being required for heating the air to the proper temperature. About 25 tons of galvanized steel sheets are required to make ducts and flues for distributing the air.

The finishing, mill supply and roll grinding rooms and the machine shop are to be heated 70 deg. F. when outside temperature is zero, using entirely fresh air. The various rooms require 10 to 20 minute air changes. These requirements call for a ¾ housed fan, having an 8-ft. diameter blast wheel, driven by a 9-in. x 7-in. enclosed self-oiling type engine. The machine room requires the most particular attention in the matter of heating. Experience has shown that sufficient heat to keep moisture in suspension and sufficient circulation of air to carry off that moisture is best met with a blower system. For heating the machine, beater and pump rooms, 70 deg. F. in zero weather is required with air changes of 10, 20 and 30 minutes respectively. For these rooms, a full housed steel plate fan, the blast wheel of which is 13 ft. in



Engine and Fan for Heating Plant.

diameter, direct-connected to a 13-in. x 16-in. horizontal side crank engine, will be used. About 25,000 lbs. of galvanized iron will be used for the air distribution system. The screen room will also be heated to 70 deg. F. in zero weather with

20-minute air changes using a steel plate fan, having a blast wheel 9 ft. in diameter, connected to a 10-in. x 12-in. horizontal side crank engine. Another complete apparatus will be used in heating the generator room to 60 deg. F., the grinding room and several lower floors to 70 deg. F. in zero weather with air changes of 10, 25 and 30 minutes respectively. This apparatus will consist of a special full housed steel plate fan, having an 8-ft. blast wheel direct-connected to a 9-in. x 7-in. enclosed self-oiling engine.

A New Buda Ratchet Jack.

Aside from the use of better materials, and heavier general construction and more accurate workmanship, little progress has been made in the design of ratchet jacks for some years. The rapidity of operation makes the ratchet jack a popular form. However, up to the present it has been deemed inadvisable to use ratchet jacks beyond a capacity of 15 tons. In fact, manufacturers have not encouraged their use beyond this

Buda Large Capacity Ratchet Jack.

point. It has been shown that even a 15-ton jack, though well made in every particular, reaches its limit at that mark and there is a tendency of the teeth to upset under full load.

The 20-ton jack shown herewith is designed to overcome these limitations. It is equipped with special pawls which have triple teeth; the full capacity is therefore distributed over three teeth in the rack, giving a load of less than seven tons on each tooth. Taking 15 tons as the limiting load per tooth, a safety factor of over 100 per cent. is here provided.

Another special feature is an extra large fulcrum pin of high carbon steel, tempered and ground. The shearing tendency has been reduced by a unique design of bearing. The lower half of the lever, through which the pin extends, is fashioned to contain a shoulder. The bushing around the pin extends through the frame and on to the shoulder of the lever, thus supporting the fulcrum pin between the lever and the frame. A special design of the pawls was also necessary to cause the triple teeth to engage the rack at all times. An improved arrangement for changing the direction of the lifting bar, or rack, has also been adopted, which is simple and is handy for the user. The jack is single acting, the load being raised on the downward stroke of the lever.

The frame and small working parts of the jack are malleable iron; the socket lever of open hearth steel; the rack of high carbon open hearth steel; the pawls are drop forged, case hardened; the fulcrum pin, high carbon steel, tempered and ground. A test of the mechanical efficiency of the jack gave a figure of 77 per cent. It is made by the Buda Foundry & Manufacturing Co., Chicago, and is known as No. 43B.

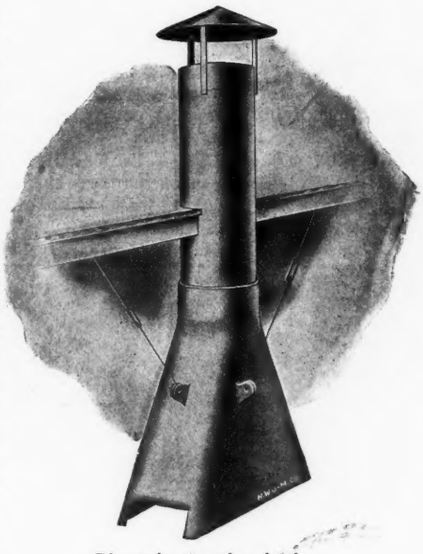
Car Lighting Engineers.

At the first annual convention of the Association of Car Lighting Engineers, which is to be held in the Grand Pacific Hotel, Chicago, November 17, 18 and 19, papers will be read as follows: History of Car Lighting, by P. Kennedy, Consolidated Railway Electric Lighting & Equipment Co., New York; History of Axle Lighting, by W. L. Bliss, Bliss Electric Car Lighting Co., Milwaukee, Wis.; Care and Maintenance of Storage Batteries, by W. H. Bauer, National Battery Co.; Railway Train Lighting, a paper by A. H. Bauer, read in Chicago in 1892, to be read at this meeting by W. H. Bauer. There will be discussions of the following subjects: Storage Batteries; Straight Electric Lighting of Cars; Head-End System; Axle Lighting; Straight Storage Lighting; Lamps; Train Connectors and Wiring of Cars; Organizing and Systematizing Work.

The social features will include a dinner on Wednesday evening, the 18th, and a smoker the following evening. The officers of the association were given in the notice printed last week, page 1309. The Executive Committee is composed of H. C. Meloy (L. S. & M. S.), O. W. Ott (O. S. L.), G. W. Murray (S. P. L. A. & S. L.), and C. W. Perry (Soo Line).

Phoenix Smoke Jack.

The Phoenix smoke jack, made by the H. W. Johns-Manville Co., New York, differs from the ordinary built up jack in that it consists of but three parts: the hood, circular stack and cowl, all of which are fastened together with Phoenix compound. The material used in its construction is absolutely fire and acid proof, so that the jack is not affected in any way by heat, moisture, acids or the gases of combustion. The jack is reinforced with extra heavy galvanized iron wire cloth which is imbedded in the material, giving strength and rigidity. The jack is supported by hanging rods attached to the eye openings in the hood. These openings are made of the same material as the jack and are reinforced with heavy wire cable, the ends of which are unraveled and interwoven with the wire cloth. These rods are covered with Phoenix compound to prevent deterioration. The interior of the jack is perfectly smooth, having no protruding bolt heads or flanges. The average thickness of the jack is ⅝ in. and the weight from 4 to 4½ lbs. per sq. ft.



Phoenix Smoke Jack.

Preservative and Other Compounds for Railroad Shops.

The steam joint cement made by George Callahan & Co., New York, is a dry powder which when mixed with linseed oil has several uses, according to different consistencies, being either a paint, paste or putty. As a paint, this cement becomes a preventative of corrosion of metal surfaces in structural iron work, locomotives, track tanks, etc. As a paste or putty, its use is especially of interest to railroads for making tight the joints of front end doors, under stack saddles, flange joints and other uses to which putty is often put. The fact that this cement is unaffected by heat makes it much superior to putty.

A water-proof liquid coating called "Elastica," said to form

a coat several times as thick as paint, is also made by this company. It is used on roofs of cars, stations or shop buildings. This coating, either red or black, is an oil composition. It is claimed to be elastic, not affected by either heat or cold, and will not crack or peel because of contraction or expansion of the surface on which it is put. This coating is used on either metal, felt or wood. As it contains no inflammable chemicals there is no danger from engine sparks.

The Callahan Anti-Slip belt dressing is made for use on either leather, rubber or canvas belts. It is a preservative, water-proof compound, which fills the pores of the belt and gives it a waxy surface, which, however, is not sticky. This dressing is said to contain no tar, rosin, gum or substances injurious to the belt. Another railroad specialty made by this company is a soldering fluid, said to be non-corrosive, non-poisonous and especially valuable for tin, copper, galvanized iron and sheet metal work. It is claimed that the use of this fluid keeps the soldering iron clean, making filing of it unnecessary.

Fairbanks-Morse Gasoline Engine.

The new Scherzer bascule span at Cleveland, Ohio, built this year by the New York, Chicago & St. Louis across the channel of the Cuyahoga river, was described in the *Railroad Age Gazette* of June 5, 1908. This span is a double-track, single-leaf bridge, 160 ft. long, center to center of bearings, and 29 ft. 6 in. wide, center to center of trusses. The bridge is operated by two direct-current electric motors of 50 h.p. each. There is also a 9 h.p. gasolene engine auxiliary, to operate the bridge should there be any trouble from defective current or electrical equipment. This 9 h.p. engine, working alone, will lift the bridge in 12 minutes. It was supplied by Fairbanks, Morse & Co., Chicago.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Manley B. Cutter, heretofore General Manager of the Lehigh Valley, has been appointed General Manager of the Iowa Central and the Minneapolis & St. Louis.

W. D. Herring has resigned as General Claim Agent of the Texas & New Orleans at Houston, Tex. All correspondence heretofore addressed to Mr. Herring should be addressed to Lamar Smith, Claim Agent, Houston, Tex.

Major H. A. Schwanecke, Vice-President of the Pittsburgh, Binghamton & Eastern, who has been critically ill at his home in Marshall, Ill., with asthmatic bronchitis, and who was not expected to recover, is now rapidly on the mend and his early recovery is assured.

W. B. Wilkins has been appointed District Auditor of the Union Pacific, with headquarters at Omaha, Neb. Mr. Wilkins will represent the accounting department in connection with matters affecting division accounting, and perform such other duties as may be assigned to him.

W. D. Herring, General Claim Agent of the Texas & New Orleans, has been appointed General Claim Agent of the Houston & Texas Central, Houston, East & West Texas, and Houston & Shreveport, succeeding Clayton Herrington, assigned to other duties with the Legal Department.

John D. Morton, whose appointment as General Auditor of the Canadian Northern Ontario, the Canadian Northern Quebec, the Quebec & Lake St. John, and the Halifax & Southwestern, has been announced in these columns, was born in 1857 at London, Ont. He began railroad work in 1873 on the Great Western of Canada as telegraph operator, and in 1879 was made ticket agent. Two years later he became station agent, and in January, 1882, was appointed mechanical clerk on the Des Moines & Fort Dodge. In November of the next year he went into the stores department of the Canadian Pacific at Winnipeg, and in 1883 was made General Storekeeper on the Manitoba & Northwestern, now part of the Canadian Pacific. By 1886 he had become Chief Clerk in the General Manager's office, and in 1893 was made Commercial Accountant. Six years later he became Accountant on Construction of the Ontario & Rainy River. In 1902 he was appointed Accountant on Construction of the Halifax & Southwestern, and four years later became Chief Accountant of the Canadian Northern, which position he still retains in addition to his new duties.

John S. Peter, whose appointment as First Vice-President and General Manager of the San Antonio & Aransas Pass has previously been announced, received his education in the public schools. He began railroad work in 1873 as rodman on the Erie and in 1875 he was made Assistant Engineer of the Geneva, Hornellsville & Pine Creek, now part of the Northern Central. From 1876 to 1881 he was in the Motive Power department of the New York, Lake Erie & Western, now the Erie. From November, 1881, to November, 1882, he was Chief Engineer of the Allegheny Central, now part of the Pittsburgh, Shawmut & Northern, following which he was Chief Engineer of the Lackawanna & Pittsburgh, now part of the P., S. & N. From January to July, 1885, he was General Superintendent, and in July, 1886, he went to the Burlington & Missouri River, now part of the Chicago, Burlington & Quincy, as Assistant Engineer and Trainmaster. From 1890 to 1896 he was City Engineer of Corpus Christi, Tex. In July, 1896, he re-entered railroad service as Roadmaster of the Chicago, Rock Island & Pacific. In 1899 he was made Chief Engineer and Roadmaster of the Chicago, Rock Island & Texas, now the Chicago, Rock Island & Gulf, and in December, 1903, he was appointed Chief Engineer of the Chicago, Rock Island & Gulf. He was appointed Superintendent of Maintenance of Way of the San Antonio & Aransas Pass in January, 1907, and in February, 1908, he was made Acting General Manager of the same road. He was elected First Vice-President and General Manager on October 12, 1908.

John S. Peter.

Operating Officers.

C. A. Austin has been appointed Trainmaster of the Lehigh Valley at Jersey City, N. J.

C. S. Hayden, Superintendent of the Iowa Central, has resigned, effective December 1.

C. G. Smith, Trainmaster of the Erie at Galion, Ohio, has been transferred to Cleveland.

Thomas Casey has been appointed Yardmaster of the Chicago, Rock Island & Pacific at Chickasha, Okla.

Thomas B. Kennedy, Freight Train Master of the Cumberland Valley, with office at Chambersburg, Pa., has had his authority extended over both passenger and freight trains.

R. W. Baxter, Superintendent of the Buffalo division of the Lehigh Valley, has been appointed Superintendent of Transportation, with office at South Bethlehem, Pa. C. T. O'Neal, Superintendent of the New York division, succeeds Mr. Baxter. W. W. Abbott succeeds Mr. O'Neal.

D. G. Wagner, Chief Despatcher of the Atlantic Coast Line at Sanford, Fla., has been appointed Trainmaster at Sanford, with jurisdiction over the northern end of the Jacksonville district. M. Crown, who has been Trainmaster of the entire Jacksonville district, with office at Sanford, has been transferred to Lakeland, Fla., and will have jurisdiction over the

southern end of the Jacksonville district. R. L. Peck succeeds Mr. Wagner.

John F. Maguire, Superintendent of Transportation of the Lehigh Valley, has been appointed General Manager, with office at South Bethlehem, Pa., succeeding M. B. Cutter, resigned. Mr. Maguire was born in 1862 at Southfield, Orange county, N. Y., and began railroad work in 1878 on the Erie as a telegraph operator and station agent. In 1885 he was made Train Despatcher, and the next year was promoted to the position of Chief Train Despatcher, and later became Trainmaster. In 1887 he was appointed Assistant Superintendent and in 1888 was made Superintendent. After being Superintendent on different divisions he was made Superintendent of the New York division in 1899, and two years later was promoted to Assistant Superintendent of Transportation of the Erie. In April, 1903, he was made Superintendent of Transportation, and later went to the Lehigh Valley as Superintendent, from which position he was promoted to Assistant Superintendent of Transportation, and was later made Superintendent of Transportation, which position he held until his appointment as General Manager.

John F. Maguire.

Traffic Officers.

Guy L. Stewart has been appointed Agricultural and Industrial Agent of the St. Louis Southwestern, with office at St. Louis, Mo.

E. B. Byers has been appointed Contracting Freight Agent of the Illinois Central at Birmingham, Ala., succeeding J. E. Estes, resigned.

W. P. Overbay has been appointed Traveling Passenger Agent of the Missouri, Kansas & Texas at Chicago, succeeding Joseph Bowes, resigned.

R. A. Chadwick has been appointed to the new office of Assistant General Freight Agent of the Tennessee Central, with headquarters at Nashville, Tenn.

O. C. Turlington has been appointed Traveling Freight Agent of the Chicago, Rock Island & Pacific at Little Rock, Ark., succeeding H. W. Stigler, resigned.

Charles Shackell, Commercial Agent of the Chicago, Milwaukee & St. Paul, at Des Moines, Iowa, has been appointed Chief Clerk of the Tariff Bureau at Chicago.

A. W. Arnold has been appointed City Passenger Agent of the Chicago Great Western at St. Joseph, Mo., succeeding J. H. Cummings, resigned to enter the Freight Department of the same road.

E. J. Vasey, Freight Agent of the Philadelphia & Reading at Reading, Pa., has been appointed Freight Agent at Wilmington, Del., succeeding S. L. Bower, resigned. H. M. Jenkins, station agent at Tower City, Pa., succeeds Mr. Vasey.

Engineering and Rolling Stock Officers.

George J. Duffy has been appointed Assistant Master Mechanic of the Lake Erie & Western at Lima, Ohio.

F. D. Lakin, Superintendent of the Erie at Galion, Ohio, has been appointed Division Engineer at Meadville, Pa.

H. A. Logue, Passenger Train Master of the Cumberland Valley, with office at Chambersburg, Pa., has been appointed Signal Engineer.

A. J. Wade has been appointed Master Mechanic of the Louisiana & Arkansas at Stamp, Ark., succeeding F. A. Symonds, resigned.

G. W. Foster has been appointed General Foreman of Shops of the Lake Erie, Alliance & Wheeling at Alliance, Ohio, succeeding W. S. Jackson, resigned.

J. H. James, Master Mechanic of the Pennsylvania at Olean, N. Y., has been appointed Master Mechanic of the Buffalo & Allegheny division, with office at Buffalo, N. Y.

Frank T. Darrow has been appointed Engineer Maintenance of Way of the Chicago, Burlington & Quincy, with office at Lincoln, Neb., succeeding I. S. P. Weeks, deceased.

D. E. Meyers has been appointed Foreman of the Motive Power and Car Departments of the Louisiana & Arkansas, with office at Minden, La., succeeding J. B. Beaird, resigned.

W. R. Edwards, chief draftsman in the engineering department of the Baltimore & Ohio, has been appointed Assistant Engineer of Bridges of the entire system, with office at Baltimore, Md.

R. E. Smith, Road Foreman of Engines of the Canadian Pacific at Medicine Hat, Alb., Can., has been appointed Master Mechanic of the Second district, with headquarters at Medicine Hat, his former position having been abolished.

A. R. Ayers, Assistant Superintendent of Shops of the Lake Shore & Michigan Southern at Collinwood, Ohio, has been appointed Assistant Master Mechanic at Elkhart, Ind. F. H. Reagan, General Foreman of the Collinwood shops, succeeds Mr. Ayers, and B. F. Kuhn, Engine House Foreman at Ashtabula, Ohio, succeeds Mr. Reagan. W. S. Jackson, General Foreman of Shops of the Lake Erie, Alliance & Wheeling at Alliance, Ohio, succeeds Mr. Kuhn. Mr. Ayers graduated from Cornell University in 1900 as a Mechanical Engineer. He began railroad work as a special apprentice on the Lake Shore in 1900 and in 1903 was appointed Special Inspector. In 1905 he was appointed night Enginehouse Foreman at Elkhart and in 1906 became Assistant General Foreman of the Collinwood shops. He was Superintendent of Shops at Elkhart from 1907 to January 1, 1908, when he was appointed Assistant Superintendent of Shops at Collinwood. His appointment as Assistant Master Mechanic at Elkhart was effective November 1.

Purchasing Officers.

E. E. Bashford has been appointed Assistant Purchasing Agent of the Mexican Central, with office at New York, succeeding E. A. Mason, resigned.

OBITUARY.

Thomas Greenway, recently appointed a member of the Board of Railway Commissioners of Canada, died of pneumonia October 30, at Ottawa, Ont.

J. H. Larrabee, for 40 years Traveling Passenger Agent of the Baltimore & Ohio Southwestern at Cincinnati and Chillicothe, Ohio, died at Chillicothe on November 4.

Chester A. Frazer, formerly Assistant Superintendent of Terminals of the Chicago, Milwaukee & St. Paul at Chicago, and for eight years Station Master in Milwaukee, Wis., died on November 4 in St. Louis, Mo.

W. D. Cornish, Vice-President of the Union Pacific, the Southern Pacific, and of the Oregon Short Line and the Oregon Railroad & Navigation, died November 7 at Chicago from heart disease. He was 56 years old and lived at Orange, N. J.

Chester A. Fraser, Assistant Superintendent of Terminals of the Chicago, Milwaukee & St. Paul at Chicago, died in Milwaukee on Nov. 3. He was 49 years old and had been ill for more than a year. He began railroad work 30 years ago as a freight conductor.

Charles Hartshorne, formerly Vice-President of the Lehigh Valley, died October 30 at Marion, Pa. He was born in 1829 at Philadelphia, Pa., and began railroad work in 1857. He has been President of the Lehigh & Mahanoy, since part of

the Lehigh Valley, and was elected Vice-President of the Lehigh Valley in 1899.

John P. Meany, editor of *Poor's Manual of Railroads*, died November 6, at the age of 47. His life was a notable example of the results of unvarying devotion to a single subject. He entered the *Manual* office, a boy, made the collation of railroad statistics his life work and became editor of the yearly volume when still young. He upheld the standard for completeness and accuracy which makes Poor's Manual useful throughout the world.

Thomas E. Jarrett, formerly General Superintendent of the Kansas City Southern, died at Shreveport, La., November 2 from swamp fever. He was 50 years old. In 1899 he was appointed General Foreman of Bridges and Buildings of the Kansas City Southern, and was later appointed Superintendent of the Southern division. In 1903 he was made General Superintendent, and later resigned to become head of the Jarrett Construction Co.

Railroad Construction.

New Incorporations, Surveys, Etc.

ABILENE & SOUTHERN.—See Texas Roads.

ALABAMA & MISSISSIPPI.—Under this name the Vinegar Bend Lumber Co., of Fruitdale, Ala., it is said, is building a railroad from a connection with the Mobile & Ohio near Fruitdale to timber lands, about 12 miles. N. E. Turner, Vice-President, may be addressed.

ATCHISON, TOPEKA & SANTA FE.—President Ripley is quoted as having announced that the work of finishing the construction in east Texas, between Center and Zuber, will be resumed at an early date. (Oct. 2, p. 1074.)

ATLANTA & ST. ANDREWS BAY.—The extension of this road from Youngstown, Fla., south to Panama City, about 22 miles, has been opened for business.

ARTESIAN BELT.—See Texas Roads.

BEAVER VALLEY & NORTHWESTERN.—According to reports from Guthrie, Okla., a contract was recently let to build this line. The company was organized early this year to build from Gage, Ellis county, Okla., west via Beaver to Hooker, in Texas county, 100 miles. J. W. Webb, of Beaver, is President. (Sept. 18, p. 980.)

CANADIAN NORTHERN.—Track laying on the Goose Lake branch has been completed as far as Zealandia, Sask., 60 miles from Saskatoon. Grading has been completed 20 miles further and it is hoped to have steel laid on this section and an additional 20 miles graded before the winter operations cease. Train service will probably be operated to Zealandia before the end of the year. (Sept. 25, p. 1026.)

According to reports from Winnipeg, Man., this company recently placed in operation the extension of its Rossburn branch, previously referred to as the Brandon-Regina line, from Rossburn, near the western boundary of Manitoba, west to Regina, Sask. The line is eventually to be extended west to a point near the western boundary of Saskatchewan. (Oct. 16, p. 1175.)

CANADIAN PACIFIC.—An officer writes that the double-track line between Winnipeg, Man., and Ft. William, Ont., for a distance of 419.4 miles, has been finished, and is now in operation with the exception of 17 miles. (Oct. 30, p. 1274.)

This company, according to reports from Winnipeg, recently began operating the Manitoba & Northwestern, on the Yorktown extension, from Sheho, Sask., west to Leslie. This line is projective west to Lanigan, 82.8 miles from Yorktown, where connection is to be made with the line in operation to Saskatoon.

The following branch lines have been opened for business: on the Muskoka section from Coldwater Junction, Ont., to Coldwater, on the eastern lines; on the Moose Mountain section of the western division, from Stoughton, Sask., to Weyburn; and also on the Moose Jaw section of the western division from Moose Jaw, Sask., to Benson Pitt.

CAZENOVIA & SAUK CITY.—This company has postponed the date for letting contracts for building the first section of the proposed line from La Valle, Wis., south, via Ironton, to Cazenovia. Right of way, it is said, has been obtained for the first six miles. (July 31, p. 547.)

CENTRAL ARKANSAS (ELECTRIC).—It is said that an election of new officers for this company will be held on January 5. This line will extend from Little Rock, Ark., southeast to Pine Bluff and southwest to Hot Springs, about 90 miles. Dates for letting contracts will be decided at the January meeting. Preliminary surveys have been made and some of the right of way secured.

CHESAPEAKE & OHIO.—The Little Coal extension of the Huntington division has been extended from Madison, Va., to Clothier, about 12 miles. (July 17, p. 554.)

CHICAGO, MILWAUKEE & ST. PAUL.—The annual report of this company for the year ended June 30, 1908, says that the line from Chamberlin, S. Dak., to Rapid City, about 219 miles, was completed during the year. A line about 12 miles long was built from a point near Glenham, S. Dak., to Mobridge, at which latter place it connects with a line now building to Seattle, Tacoma and other Puget Sound points. The line from a point near Glenham, S. Dak., to Evarts, will be abandoned. The second main track on the River division from River Junction, Minn., to Richmond, and from Lake City, Minn., to Wabasha, a total distance of about 22.5 miles, has been completed. There has been expended during the year for reduction of grades and improvement of alinement the sum of $496,850.

CHICAGO, ROCK ISLAND & GULF.—See Texas Roads.

CLINTON & COLORADO SPRINGS.—C. C. Godman, of Ft. Smith, Ark., principal promoter of this projected line, is quoted as saying that construction work is to be started this month. The first to be built is from Clinton, Okla., which is on the St. Louis & San Francisco and the Kansas City, Mexico & Orient, northwest to Butler, about 25 miles. The line is projected northwest across the Panhandle of Texas and New Mexico to a point in Colorado.

COPPER RIVER RAILWAY.—According to reports from Seattle, Wash., work on this line, building from Cordova, Alaska, north to Bonanza, 195 miles, was recently suspended and will be resumed in the spring. Track has been laid from Cordova, north, about 60 miles. Early in March work on the cantilever bridge over the Copper river is to be started. It is thought that it will take about two years to finish the bridge. (Sept. 25, p. 1027.)

CORBIN COAL & COKE.—This company, with headquarters at Spokane, Wash., has been registered in British Columbia for the purpose of building railroads in that province. J. A. Harvey, Cranbrook, British Columbia, represents the company.

DALLAS, CLEBURNE & SOUTHWESTERN (MISSOURI, KANSAS & TEXAS).—See Texas Roads.

DES MOINES & SIOUX CITY (ELECTRIC).—An officer writes that financial arrangements have been made, and nearly all the right of way secured for this proposed line from Des Moines, Iowa, northwest to Sioux City, about 192 miles. It is expected to begin work early next spring. (Sept. 11, p. 932.)

EAGLE VALLEY.—Press reports from Portland, Ore., say that when 25 miles of this new road are completed, shipments of ore will begin to Baker City and Sumpter. It is said that Baker City subscribed $100,000 to the capital stock. (June 19, p. 208.)

GEORGIA & FLORIDA.—Press reports from Richmond, Va., indicate that this company has let contract for improvements to cost about $500,000, which contract, it is said, includes the building of 30 miles of road and a steel bridge over the Altamaha river. (Oct. 16, p. 1176.)

GRAHAM, ROSWELL & WESTERN.—See Texas Roads.

GRAND TRUNK PACIFIC.—According to reports from Montreal, President C. M. Hayes is quoted as saying that the road will be finished by the end of 1911, and in operation from Port Arthur west to Saskatoon the following spring. The company has a charter to build a branch line to Vancouver, and will probably build to that port. President Hayes con-

firmed the report that contracts will be let at once for work on 300 miles from Wolf creek west towards the Rocky mountains. This will leave a gap of about 400 miles. The whole line will probably be under construction in the course of a year.

Great Northern.—P. Welch, member of the firm of Foley, Welch & Stewart, railroad contractors, who built the line of this company from Marcus, Wash., west to Keremeos, B. C., is quoted as having said that the Vancouver, Victoria & Eastern has been completed as far as Keremeos, B. C., and that late this fall trains will be running to Hedley, 25 miles further. Work will be continued all winter and it is expected that Princeton will be reached in May. The work of building the line over the Hope mountains into the Fraser river valley will be undertaken and rushed to completion, also that southern British Columbia will be the scene of unusual activity in railroad construction next spring. There yet remains to be closed a gap between Similkameen and Sumas.

Gulf, Colorado & Santa Fe.—See Texas Roads.

Gulf, Texas & Western.—See Texas Roads.

Iowa & Omaha Short Line.—President G. W. Adams, Des Moines, Iowa, is said to be considering bids for the construction and equipment of a line from Omaha, Neb., east to Des Moines, Iowa, 125 miles. (Sept. 4, p. 888.)

Kansas City, Mexico & Orient.—See Texas Roads.

Kearney & Loup Valley.—Incorporated in Nebraska with $120,000 capital stock to build a railroad between Kearney, in Buffalo county, Neb., and Hyannis, in Grant county. Part of the surveys, it is said, have already been completed. The incorporators include E. Morey, W. L. Hand, V. B. Sample and T. H. Bolte, all of Kearney.

Lake Erie & Youngstown (Electric).—Press reports indicate that active work on this line has begun from the Conneaut, Ohio, end, and that it is expected to have this part of the line in operation by May, 1909. (April 24, p. 591.)

Marshall & East Texas.—See Texas Roads.

Montreal & Southern Counties.—This company, building a 16-mile line in Quebec, recently gave contracts, it is said, to John Quinlan for the concrete work, and to the United States Steel Corporation for all the necessary steel to be used in building the line. J. A. Burnett, General Manager and Chief Engineer, Montreal, Que.

Nevada Northern.—The Mines Branch, extending from Ely City, Nev., west to Veteran, 13 miles, has been opened for business.

Ochiltree, Enid & Southwestern.—See Texas Roads.

Ocilla Southern.—Organized in Georgia, with $150,000 capital, to build a line from Ocilla, Ga., south to Nashville, about 30 miles. J. L. Paulk, W. Henderson, W. N. Smith and J. N. Quincy, all of Ocilla, are said to be interested.

Roanoke & Bent Mountain (Electric).—Surveys, it is said, for this line, which will run from Roanoke, Va., southwest to Floyd, 45 miles, are now in progress. W. H. Price, President, Elliston, Va.; J. C. Terry, Vice-President, and A. F. Thornberry, Chief Engineer, both of Bent Mountain.

Roscoe, Snyder & Pacific.—See Texas Roads.

St. Louis & San Francisco.—A new branch of the Sherman district of the St. Louis, San Francisco & Texas, extending from Carrollton, Tex., south to Irving, 10.5 miles, has been opened for business.

St. Louis, San Francisco & Texas.—See St. Louis & San Francisco.

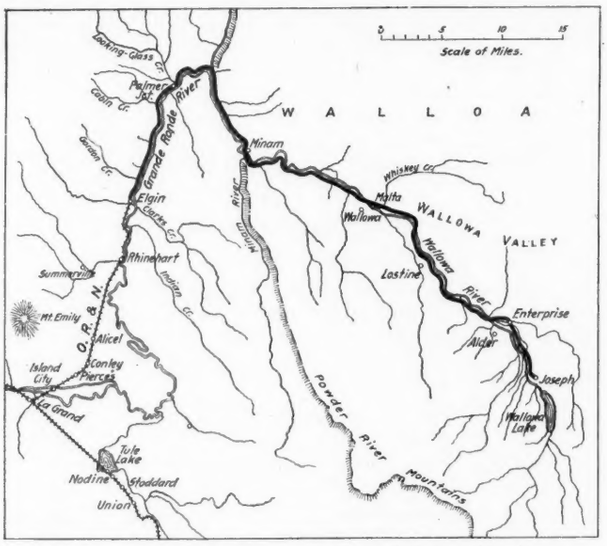
St. Paul Bridge & Terminal Railway.—An officer writes that contract has been let to W. G. Hoy, of St. Paul, for the grading and the piles for bridges on the line now under construction from South St. Paul, Minn., to St. Paul yards at Dayton's Bluff, 2¾ miles. Maximum grade will be 0.7 per cent. approaching the river and the balance level. Maximum curvature will be 5 deg. on the west side of the Mississippi river. There is to be a steel bridge over the Mississippi river with pile trestle approaches. Alfred Jackson, St. Paul, is engineer in charge. (Oct. 30, p. 1276.)

San Antonio, Chapin & Rio Grande Valley.—See Texas Roads.

San Diego, El Paso & St. Louis.—See Texas Roads.

Sewall Valley.—Work is said to be now under way on a line being built by the Meadow River Coal & Land Co., from Meadow Creek, W. Va., on the Chesapeake & Ohio, to coal and timber lands. It is expected that track laying will be started this year. T. W. Raine, President, Evenwood, W. Va., and E. S. Jones, Vice-President, Scranton, Pa.

Oregon Railroad & Navigation.—The Elgin extension of this line, shown in the accompanying cut, required about 30 miles of canyon and 33 miles of valley work. The maximum grade is 1 per cent. and maximum curves are 15 deg. The



Elgin Extension; Oregon Railroad & Navigation.

route extends from Elgin, Ore., 12.8 miles to Palmer Junction; 13.9 miles to Minam; 12.9 miles to Wallowa; 7.8 miles to Lostine; 10.2 miles to Enterprise, and 5.8 miles to Joseph. Fifty-seven miles of track is now laid.

Southern.—An officer writes that the Bushnell extension, being built in Tennessee under the name of the Tennessee & Carolina Southern, and in North Carolina under the name of the Carolina & Tennessee Southern, from Maryville, Tenn., east to Bushnell, N. C., 65 miles, is expected to be ready for operation from Maryville east to Abram's Creek, 25.3 miles, this month. Grading and track laying has been finished on this section. On the other end of the line from Bushnell west towards Maryville trains are now in operation on the first 13.82 miles to Eagle Creek. On the remaining section about 12 miles between Eagle Creek and Abram's Creek has not yet been graded. It is uncertain when this gap will be closed as the company is experiencing difficulty in securing the necessary right of way. (R. R. G., March 13, p. 394.)

Southwestern Interurban of Mangum.—Rights of way are being secured for a line from Mangum, Okla., west to Francis, 22 miles. The company was incorporated last year in Oklahoma with $1,000,000 capital and office at Mangum, to build electric lines from Mangum, via Francis to Hollis, 37 miles; from Mangum to Granite and Coldell, 40 miles, with a branch from Granite to Hobart, 15 miles, and from Mangum to Altus, 27 miles. It is expected to begin work early next spring. J. W. Solomon, President, of Reed, and J. O. McCollister, Secretary, Mangum.

Spokane, Portland & Seattle.—According to press reports the large double-track bridge over the Columbia river, also the one over the Willamette river on the 10-mile branch from Vancouver, Wash., south to Portland, Ore., was finished recently. (July 10, p. 55.)

An officer of the Great Northern, which is building this line jointly with the Northern Pacific, is quoted as saying that the extension from Pasco, Wash., east to Spokane, 145 miles, is expected to be in operation by the middle of February, 1909. (March 27, p. 462.)

SUWANNEE RIVER RAILWAY & POWER CO.—Incorporated in Florida, with a capital stock of $3,000,000, for the purpose of operating a series of electric lines radiating from Jacksonville, having a total mileage of 75 miles. D. G. Zeigler & Co., Jacksonville, will receive bids on construction work within 60 days.

TEXAS & PACIFIC.—See Texas Roads.

TEXAS ROADS.—A large number of new lines are projected in Texas on which work is to be begun in 1909 as follows:

J. F. Edwards, of St. Louis, Mo., representing capitalists of that place and of Chicago, Ill., has submitted a proposition to the Business Men's Club of San Antonio, Tex., to build a railroad from San Antonio, south to Brownsville, about 300 miles. The conditions require that the city of San Antonio contributes $100,000 and provides the right-of-way from the southern line of Bexar county north to a suitable site for terminals in San Antonio; terminals for freight and passenger stations, and 10 acres of land outside but close to the city limits and along the right of way for yards. On the acceptance of these terms and the securing of the property, the promoters of the railroad agree to begin work within 30 days. (Aug. 21, p. 789.)

George Northrup is promoting a railroad from San Antonio, Tex., south to Laredo, thence southeast down the valley of the Rio Grande to Brownsville, a total distance of about 325 miles. Large bonuses of money and land have been raised in aid of this project and it is claimed that the prospects of the early building of the line are good. Frederick N. Finney, of Milwaukee, Wis., former President of the Missouri, Kansas & Texas, is back of the project which Mr. Northrup is actively promoting. Mr. Finney is now on the ground and is giving personal attention to directing the preliminary matters relating to building of the line, and it is thought that the road when completed will be taken over and operated as a part of the Missouri, Kansas & Texas system. It will connect with the latter at San Antonio.

Artesian Belt.—It is said that Dr. C. F. Simmons, of San Antonio, Tex., and Excelsior Springs, Mo., has made application in Texas to incorporate this company. Surveys made and grading contract let to the J. F. Burns Construction Co., of Devine, Tex., for building a line from Macdona, Tex., on the Southern Pacific, south about 40 miles. Surveys being made for an additional 25 miles to Simmons City in Live Oak county. Work on the first section will, it is expected, be finished by June, 1909. The line is eventually to be extended to Rio Grande, about 230 miles from Macdona. W. M. Bradburn, 215 Alamo Plaza, San Antonio, Tex., Chief Engineer. A. M. Bates, Excelsior Springs, Mo.; J. Campbell, Campbelltown, Tex.; J. O. Terrell and J. P. Barkley, of San Antonio, are said to be interested. (See Texas Roads, July 24, p. 601.)

The San Antonio, Chapin & Rio Grande Valley is another new line to open up a rich part of the lower Rio Grande valley. Construction work is now under way and about 15 miles of track has been laid. It will run from Chapin to Falfurrias, about 80 miles, and may be ultimately extended to San Antonio. (Sept. 18, p. 981.)

Contract for the construction of the Abilene & Southern between Abilene, Tex., and Winters, about 35 miles, was recently let. This line is to be eventually extended southeast from Winters to Brady, an additional 75 miles. It is being built by the Colorado & Southern interests. The new line will connect with the Abilene & Northern at Abilene, and with the Fort Worth & Rio Grande division of the Frisco at Brady. Morgan Jones, President of the Wichita Valley, of Seymour, Tex., is at the head of the Abilene & Southern.

The Dallas, Cleburne & Southwestern (Missouri, Kansas & Texas) is planning to extend its line north from Egan, Tex., to Dallas, 25 miles, and south from Cleburne to Glen Rose, about 30 miles. It is stated by B. P. McDonald, President of this road, that it is planned to ultimately extend the line south to San Antonio, more than 200 miles.

The Marshall & East Texas, formerly known as the Texas Southern, is being rebuilt as rapidly as possible by the Union Trust Company of St. Louis, which recently acquired the property. This line is 74 miles long and runs between Marshall, Tex., and Winnsboro. The new owners have plans to extend the road south from Marshall to Houston, about 185 miles. These same interests also own the St. Louis, Brownsville & Mexico, which runs between Brownsville and Algoa, operating its own trains into Houston over the Santa Fe track from Algoa. The two roads are to be connected up and made into one system, it is stated. (Sept. 11, p. 933.)

The Roscoe, Snyder & Pacific is to run from Roscoe, Tex., to a point on the Texas-New Mexico border, about 200 miles. The road is in operation from Roscoe to Snyder, 20 miles, and construction work is in progress on an additional 20 miles north from Snyder. This line will pass through the center of a wide section of western Texas that is now without railroad facilities. (Sept. 25, p. 1028.)

The Texas State Railroad is being built by penitentiary convicts from Rusk, Tex., to Palestine, 30 miles. About 20 miles of this line are finished. (Oct. 2, p. 1076.)

Texas & Pacific.—It is reported that the branch line which this company is building from Monahans, Tex., to Grand Falls will be continued to Alpine, about 110 miles, where connection will be made with the Southern Pacific. (Oct. 23, p. 1227.)

Surveys made, it is said, by the Chicago, Rock Island & Gulf for an extension of its Graham branch from Graham, Tex., southwest to Stamford, about 75 miles.

The gap in the Kansas City, Mexico & Orient near the Pease river is finished and through traffic is to be inaugurated soon between Wichita, Kan., and Sweetwater, Tex., 432 miles. Upon the closing of this gap the work of extending the line south from Sweetwater to San Angelo and thence to the crossing of the Rio Grande by way of Alpine, will be pushed vigorously, it is said. From Sweetwater to the proposed crossing of the Rio Grande, near Presidio del Norte, it is about 300 miles. (Nov. 6, p. 1321.)

The Gulf, Colorado & Santa Fe is required, under the terms of the act of the legislature by which it merged several of its lines in East Texas, to build an extension of its line from Longview, Tex., to some point on the Red river, about 125 miles, within two years from the date the consolidation act went into effect. It was also required to build an extension from Center to Timpson, about 15 miles, within the same period. It is said that the work of building these extensions will be started in a few months. (R. R. G., March 13, p. 391.)

Gulf, Texas & Western.—Incorporated in Texas to build a line from Burrs Ferry on the Sabine river in Newton county northwest to Benjamin, on the Kansas City & Mexico, in Knox county, about 500 miles. Ben. B. Cane, of Tyler, a director, is quoted as saying that work is to be started this year. The road is to pass through the cities of Henderson, Tyler, Canton, Kaufman or Terrell, Dallas, Jacksboro, Olney, Seymour and Vera, with a branch line to Ft. Worth.

Ochiltree, Enid & Southwestern.—Application made by this company, with $500,000 capital, for a charter in Texas. It is intended to build the first section of a line from Dalhart, Texas, east to Ochiltree, 101 miles, and on the completion of this work the line is to be extended east about 20 miles, and eventually 150 miles further east to Enid, Okla. G. M. Perry, County Judge of Ochiltree, is principal promoter, and will probably be president. R. E. Taylor, of Canadian, will be the attorney for the road. It is said that the project has been financed.

Graham, Roswell & Western.—Press reports say that this company has applied for a charter in Texas to build a line from Graham, on the Chicago, Rock Island & Gulf, in Young county, Texas, westerly to a point on the western boundary of Texas in Yoakum county, about 350 miles. The incorporators include: J. E. Morrision, E. S. Graham, S. R. Crawford, S. B. Street, all of Young county; A. D. Goodenough, of De Smith county, and H. P. Faris, of Clinton, Mo.

San Diego, El Paso & St. Louis.—It is said that this company, with $100,000 capital, has applied for a charter in Texas to build about 100 miles of railroad northeast from El Paso, Tex. W. C. Davis, J. A. Happer, A. C. Courchesne, W. J. Harris and W. Cooley, all of El Paso, are said to be interested.

TEXAS STATE RAILROAD.—See Texas Roads.

VANCOUVER, VICTORIA & EASTERN.—See Great Northern.

WESTERN PACIFIC.—Tracklaying in Nevada has progressed to within eight miles of Deeth, Nev., 220 miles from Salt Lake City, Utah. There are a total of 43 on the line between Oakland, Cal., and Salt Lake City, with 20 yet to be built, the longest one of which is 7,306 ft. long, the headings being now within 444 ft. of each other. (October 30, p. 1276.)

Railroad Financial News.

Boston & Albany.—H. B. Chapin has been elected a director, succeeding E. S. Draper, resigned.

Central of Oregon.—Foreclosure proceedings have been brought in the federal court at Portland, Ore., and Chester V. Dolph and H. N. Berry have been appointed receivers of this 83-mile road, which runs from Union Junction, Ore., on the Oregon Railroad & Navigation, to Walla Walla, on the Northern Pacific.

Chicago & Alton.—William Salomon & Co., New York, are offering the unsold portion of the $1,640,000 4½ per cent. equipment bonds, series E, at a price to yield 4¾ per cent. The bonds are dated November 1, 1908, and are due $82,000 semi-annually from May 1, 1909, to November 1, 1918.

Chicago & Milwaukee Electric.—See article under General News.

Chicago, Burlington & Quincy.—Stockholders on November 4 approved the purchase of the following subsidiary lines: Fulton Co. Narrow Gage Railway, Northern & Southern Illinois, Sioux City & Western, and Big Horn Railway, aggregating 304 miles. (Sept. 18, p. 982.) Daniel Willard has been elected a director, succeeding John J. Mitchell.

Chicago, Cincinnati & Louisville.—The bondholders' protective committee, S. M. Carter, Chairman; Weston Lewis, G. S. Stockwell, members, and Charles H. Gilman, Secretary, 82 Exchange street, Portland, Me., announce that of the $3,154,000 bonds, the interest on which has been defaulted, about $2,500,000 are now controlled by them.

Chicago Railways.—An initial dividend of four dollars per share for the half year ended August 31 has been declared on the participation certificates, series 1. There are 30,800 shares of the series 1, and they are entitled to an annual cumulative dividend of $8 per share.

Cincinnati, Findlay & Wayne.—Default having been made in the payment of interest due November 1, 1908, on the $1,150,000 first mortgage 4 per cent. bonds, the following bondholders' protective committee has been formed: A. H. Wiggin, S. C. Borg, H. F. Whitcomb and F. N. B. Close, Secretary, 78 Wall street, New York.

Cincinnati, Hamilton & Dayton.—Default having been made in the payment of interest on the $3,500,000 Cincinnati, Dayton & Ironton 5 per cent. bonds of 1891-1941, Kissel, Kinnicutt & Co., and Shoemaker, Bates & Co., both of New York, ask bondholders to communicate with them in regard to forming a protective committee.

Coney Island & Brooklyn Railroad.—Guy Richards and E. S. Marston have been elected directors, succeeding Louis Fitzgerald, deceased, and G. H. Southard, resigned.

Detroit, Toledo & Ironton.—It is said that an agreement has been made between the Ramsey committee representing the Detroit, Toledo & Ironton collateral trust noteholders, and the H. B. Hollins & Co. interests, by which the collateral deposited under the $5,500,000 notes of the Detroit, Toledo & Ironton is to be divided as follows: The Ramsey committee controlling a majority of the notes is to receive $5,350,000 Ann Arbor stock, and the Hollins interests are to receive $5,000,000 Detroit, Toledo & Ironton 4½ per cent. consolidated bonds. This agreement is subject to the option of the Hollins interests to buy the Ann Arbor stock for cash before January 19, 1909.

International & Great Northern.—Thomas J. Freeman, receiver, has been elected also a director. G. H. Turner has been elected a director.

Metropolitan Street Railway.—See Second Avenue.

New York Central & Hudson River.—The Guaranty Trust Co., New York, is offering $2,500,000 4 per cent. debentures of 1904-1934 at a price to yield about 4.40 per cent. This is part of an authorized issue of $50,000,000, of which there are $43,000,000 outstanding, the balance being reserved to provide for terminal and other improvements. The debentures are secured by a deed of trust, which provides that no new mortgage can be placed upon the property without including these debentures in the lien.

New York, New Haven & Hartford.—R. L. Day & Co., Estabrook & Co., and Kidder, Peabody & Co., all of New York, are offering $2,000,000 Boston & New York Air Line first mortgage 4 per cent. bonds of 1905-1955 at 101, to yield 3.95 per cent. This is part of an authorized issue of $5,000,000 secured by a first mortgage on the main line of the New York, New Haven & Hartford extending from Willimantic, Conn., to New Haven, 52 miles. Bonds are guaranteed principal and interest by the New York, New Haven & Hartford.

Northern Pacific.—An extra dividend of 11.26 per cent. has been declared upon the $155,000,000 full paid stock. The $17,453,000 required for this dividend was acquired by the Northern Pacific through the declaration of a dividend of 629 per cent. on the stock of the Northwestern Improvement Co., the stock of which is owned by the Northern Pacific. The $93,000,000 new stock offered to stockholders at par in January, 1907, and on which the final installment of 12½ per cent. remains to be paid on January 1, 1909, does not participate in this dividend. The *New York Times* published the following:

"It is said by a director of the Northern Pacific that the Improvement Co., which was incorporated in 1897, soon after the reorganization of the Northern Pacific, has carried on land and other operations on a large scale, and has profited by the enormous increase in values in the northwest during the last ten years. The company owns large coal mines in Montana and Washington, operated along the line of the Northern Pacific. It is also interested in irrigation and other land investments. A number of years ago it took over the lands of the St. Paul & Duluth, and it has at intervals purchased from the Northern Pacific itself large tracts of the road's land-grant lands. In reference to the latter transactions, it is said that when the Northern Pacific needed to sell land for which there was not a ready outside market at the time, the Northwestern Improvement Co. had frequently purchased such lands, thus supplying funds to the railway."

Pittsburgh & Lake Erie.—The directors have authorized an issue of $5,000,000 stock to be offered to shareholders at par, the extent of 50 per cent. of their holdings. This is part of the $20,000,000 new stock authorized by the shareholders in March, 1908. Before this the authorized capital stock amounted to $10,000,000.

J. Gennison Lyon has been elected a Director, succeeding J. B. Jackson, deceased.

Rock Island-Frisco Terminal.—Potter, Choate & Prentice are offering $500,000 first mortgage 5 per cent. bonds of 1907-1927 at a price to yield 5 per cent. These bonds are part of an authorized issue of $5,000,000, of which $3,000,000 are outstanding, and the balance reserved for use after 1909 for improvements, additions and betterments. The bonds are guaranteed jointly by the Chicago, Rock Island & Pacific Railway and the St. Louis & San Francisco.

Second Avenue (New York).—The receivers of the Metropolitan Street Railway have been ordered by Judge Lacombe, of the United States Circuit Court, to turn over at midnight, November 12, to George W. Linch, the state court receiver of the Second Avenue, all property covered by the lease of January 28, 1898, made with the Metropolitan Street Railway, after which time, transfers on all the lines, with a few exceptions, will be discontinued between the Second Avenue and Metropolitan lines.

Southern Indiana.—Potter, Choate & Prentice, and Proctor & Borden, both of New York, are offering $382,000 one year 6 per cent. receiver's certificates of November 1, 1908, and due November 1, 1909-1910, at a price to yield 4½ per cent. if redeemed in one year, and 5¼ per cent. if redeemed in two years.

Southern Pacific.—The regular quarterly dividend of 1½ per cent. has been declared on the common stock, payable January 2.

Toledo, St. Louis & Western.—H. S. Black has been elected a director, succeeding J. C. Brown.

Union Pacific.—Regular quarterly dividend of 2½ per cent. has been declared on the common stock, payable January 2.